

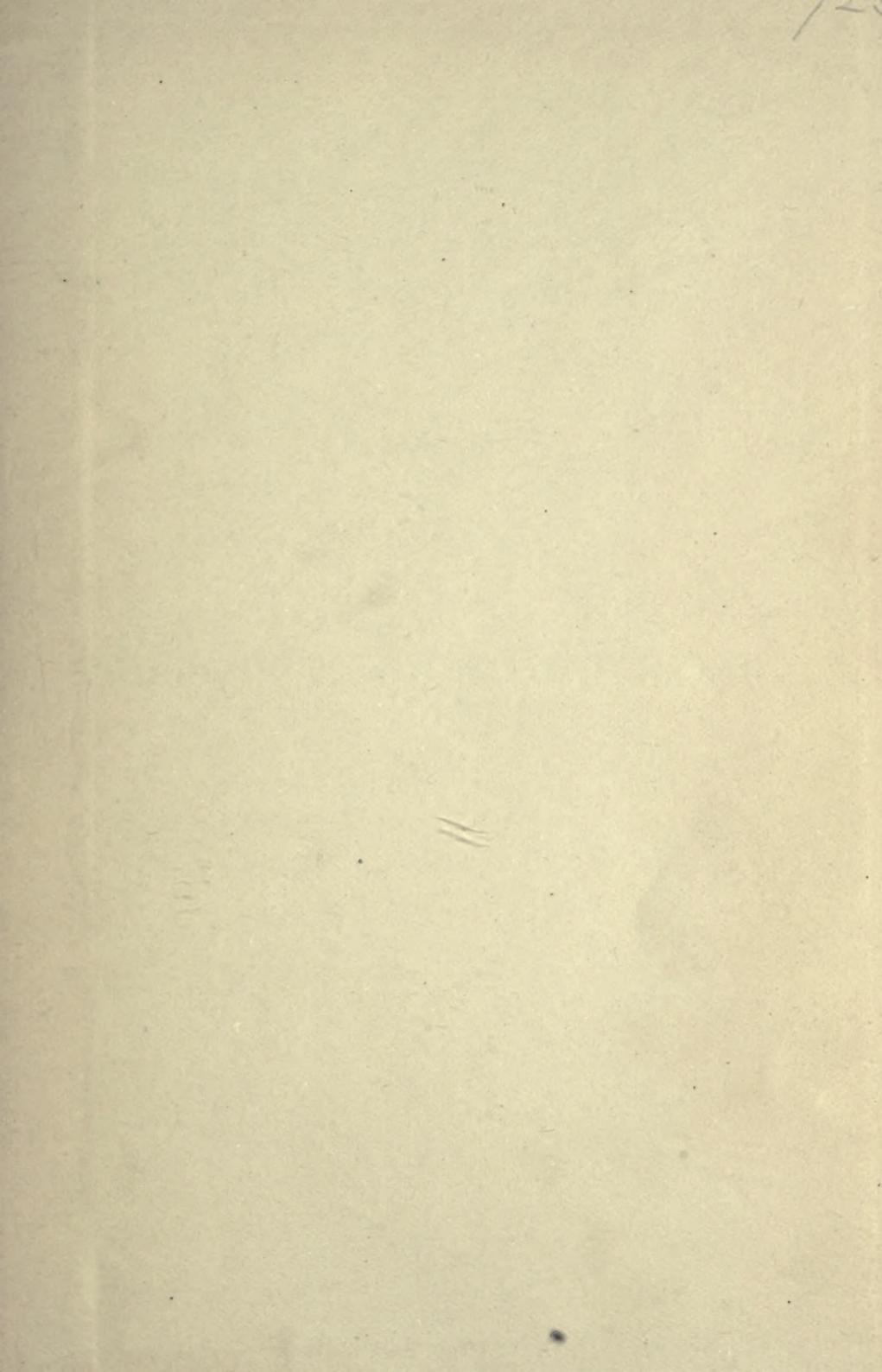


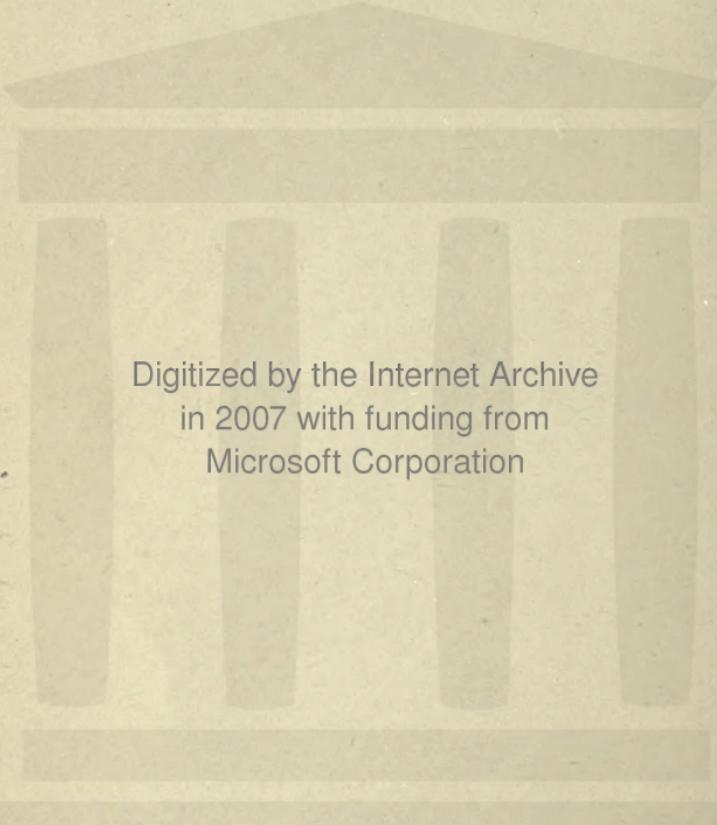
Information for the Tuberculous

By F. W. Wittich, A.M., M.D.



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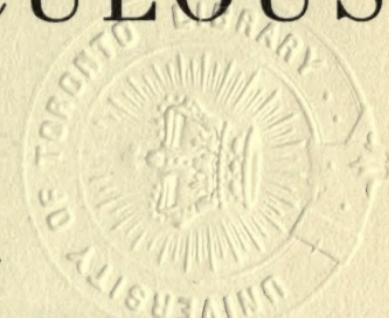
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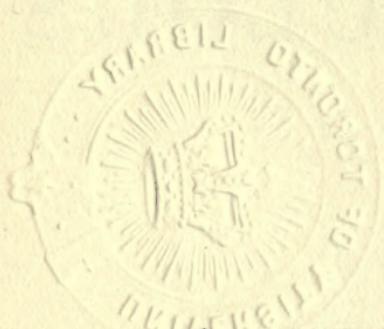
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TO
MY WIFE
JEAN WETTERAU WITTICH

There is one topic peremptorily forbidden to all well-bred, to all rational mortals—namely, their distempers. If you have not slept, or if you have slept, if you have headache, or sciatica, or leprosy, or thunder-stroke, I beseech you, by all angels, to hold your peace, and not pollute the morning, to which all the housemates bring serene and pleasant thoughts, by corruption and groans.

—*Ralph Waldo Emerson.*

PREFACE

This little book is the result of many requests from patients who exhibited great interest in weekly talks given by the author while he was doing sanatorium work. It does not claim for itself more than an attempt to help those who are struggling to take the cure. The material will be recognized by those who heard these talks, since it was used at that time.

An attempt has been made to deal with questions which frequently arise and which are constantly asked by the struggler against tuberculosis.

The author, a one time patient of no light infection, who was on the cure for more than two years but who has been enjoying good health while working steadily for the past three years, has a keen interest in everything bearing upon tuberculosis and an earnest desire to help, be it in a great way or a small one, all who are using their fighting chances. And if this little book shall aid anyone through demonstrating how best to use both time and energy in the fight, it will have fulfilled its mission.

Preface

To conquer tuberculosis in the shortest possible time, the patient must eat well in order to nourish his body; he must be a real optimist to keep his mind pleasantly occupied; he must own a great fund of common sense so as to go on steadily toward recovery without being led astray by quack medicines and poor advice; he must possess patience in unlimited abundance to prevent his growing weary of the long, long siege; he must enjoy being courageous so as to work bravely on in the right way even though his progress may seem but slow; he must have superlative will-power which compels him to fight every day,—for he must fight, if he will win.

F. W. W.

University of Minnesota Medical School,
Minneapolis, Minn.

FOREWORD

BY L. G. ROWNTREE, M.D.

Professor and Chief of the Department of Medicine, University of Minnesota.

Life, health and happiness in place of invalidism, despair and death—the difference wrought by treatment.

There are three great outstanding features in the treatment of tuberculosis which should receive the most serious consideration from the patient and the family.

1. *The Physician.* The best treatment, generally speaking, can be obtained from the tuberculosis specialist, i. e., one who devotes his entire time and attention, his life, to fighting tuberculosis and to the diagnosis, care, and prevention of the disease. Many of these specialists have been themselves its victim, have been the inmates of sanatoria and are still undergoing the cure, and hence are ideally equipped to give the wisest counsel and the best treatment.

2. *The Sanatorium.* This should play a role in the treatment of every case of tuberculosis. Why? Because it offers the best chance of recovery, because it protects the home and the public at large against infection, and finally, because it is a “manual training school” so to speak, giving the patient

Foreword

a practical education which, in event of recovery, insures the best possible care throughout life.

3. *Autotreatment*, or the patient's care of himself. This is of the greatest importance because tuberculosis is very prone to recur, to remain latent for a period, and to undergo exacerbations. The patient must follow a regime which will maintain health and prevent recurrences. Nothing will prove of greater value in this respect than the knowledge gained through residence in a sanatorium. This should be supplemented with occasional conferences with the physician.

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INFORMATION FOR THE TUBERCULOUS

PART I

CHAPTER I

ANATOMY AND PHYSIOLOGY OF THE NORMAL LUNGS

Anatomy deals with the structure; and physiology with the functions of the various organs of the body.

The essential elements for the maintenance of life are air, water, and food. To utilize the life-giving oxygen of the air, the different tissue cells of the body must be able to abstract it from the surrounding atmosphere and at the same time give in exchange the waste material representing the products of combustion in the cell substance. This is a property of all living matter for which in the highly organized animals a special set of organs is provided. In man and the higher animals these organs are known as the lungs.

The lungs are enclosed in a dome-shaped cavity called the chest to which they conform in shape. The chest is able to contract and expand by virtue

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of its bony and muscular construction. The lungs, which weigh about two and one-quarter pounds in men and one and three-quarters pounds in women, are in pairs, one situated on each side of the heart which they practically envelop. The apices or tops of the lungs extend from the base of the neck about an inch above the collar bone on the right and half an inch on the left to the conical-shaped base of the chest which rests on the muscular division between it and the abdomen called the diaphragm, the powerful muscle that aids the muscles of the chest wall in respiration. Thin serous membranes forming two closed sacs called the pleura are reflected about the lungs and line the neighboring chest wall.

The large blood vessels and bronchi enter the lungs on the sides facing the heart. These bronchial tubes go into the lungs dividing and subdividing like the branches on a tree until they become very minute, each one terminating in a tiny sac called an air cell. There are six hundred millions of these air cells one two-hundredth of an inch in diameter, so that if all of them in one's lungs were spread out one beside the other they would extend a distance of nearly fifty miles. The walls of these cells are very thin, a dozen of them not making more than the thickness of ordinary writing paper, but they are tough and strong. If this thin membrane in one pair of lungs were laid

Anatomy and Physiology of the Lungs

out over a flat surface it would carpet a hall nearly fifty feet square. Between or around the air cells the blood vessels of the lungs form a dense interlacing network called capillaries, which are just wide enough to allow the blood corpuscles to flow through them in single file, two sides of the blood vessels being exposed to the action of the air in the cells. Every blood vessel is exposed separately to the air in the air cells. If these capillary vessels could be extended over a flat surface it is estimated they would cover sixteen hundred square feet.

What the lungs really do is supply the blood with oxygen and take away the waste products resulting from combustion of the body tissues. These waste products are chiefly carbon dioxide gas and water. When a thin sack of porous animal membrane such as a pig's bladder is filled with milk and suspended in a glass of water there will be an interchange of two solutions until they are equal in composition on both sides of the sack, i. e., the water outside of the sack will have taken up some of the milk and, in turn, the milk will have taken up water so that in time both of the liquids will consist of a watery solution of milk. Gases also pass through a thin porous membrane under different pressures and mix with each other or are taken up in solution. In this way the thin but tough membrane composing the air cells of the lungs becomes the medium through which the in-

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spired oxygen is given to the blood in exchange for the carbon dioxide gas and moisture that leave the blood and enter the air cells to pass out of the lungs on exhaling. Figuring on eighteen respirations a minute, the lungs handle or exchange in a day and a night one hundred and five barrels of air and one hundred and twenty-five barrels of blood. Considering that this stupendous task is performed daily by the respiratory apparatus, the absolute necessity for a supply of pure fresh air which is obtainable in unlimited quantities practically everywhere becomes apparent at once.

To summarize: the anatomy or structure of the lungs teaches that they conform in shape with the chest, that they are capable of expansion or contraction, that they are connected with the outside air by several passages, that the bronchial tubes divide and subdivide growing smaller with each division until they terminate in innumerable tiny thin but tough-walled air cells which are surrounded by the blood vessels. All this is understood better when it is known that the physiology or function of these important organs of the body is to give to the blood that bathes these millions of air cells the fresh supply of oxygen breathed in from the pure air and at the same time carry away their many impurities.

CHAPTER II

THE TUBERCLE BACILLUS AND ITS ACTION ON THE LUNGS

All forms of life are separated into two great divisions, the Animal and the Vegetable Kingdoms. The latter is divided into six great orders: seed-plants, ferns, mosses, fungi, molds, and bacteria. Bacteria have three general shapes; rods or pencils, spheres or marbles, spirals or corkscrews. There are two kinds of bacteria indistinguishable in form, the harmless and the poisonous. It is a particular division of the latter that is of special interest to us.

So early as the first century Galen described tuberculosis as an infectious disease. In 1843, at which time microscopic investigation was in its infancy, Klencke proved by experiments with animals that the disease was transmissible but his work was disregarded. Villemin, twenty-two years later, reached the same conclusions after a long series of experiments, but neither were his results accepted by the profession as authentic until they were verified by another scientist three years later.

The tubercle bacillus, which belongs to the rod-shaped bacteria, was first cultured and its identity

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established on a solid basis by Koch in 1882, though it was probably seen in microscopic sections through tuberculous areas by Baumgarten in the same year. The bacillus, which has no power of motion, is from one-twelve-thousandth to one-six-thousandth of an inch long and about one-fifty-thousandth of an inch broad. More than five hundred could pass side by side through the eye of a fine needle without touching its edges. The microscope magnifies from eight hundred to a thousand times to enable us to see them. It is a slender rod often slightly curved and may occur singly or in small clumps. Sometimes branching forms are seen and it is not uncommon to see beaded forms. It is thought by some observers that the beaded form shows evidences of immunity or good resistive power on the part of the individual but this has not been proved.

Under the microscope like most unstained bacteria, the tubercle bacillus has a delicate drab color. It stains readily with certain dyes and manifests peculiar properties with stains that make it easily recognizable in the sputum. All bacteria multiply by forming spores or by simple division. At one time it was thought that the unstained areas in the tubercle bacillus which give it a beaded appearance when stained were spores and that these gave rise to the young forms. Now, however, it is generally understood that the bacillus when stimulated to

Tubercle Bacillus and Its Action

grow under a proper environment reaches a certain size and divides into two smaller bacilli. These in turn reach maturity and divide.

The tubercle bacillus is killed by direct sunlight in one hour and by diffuse sunlight in from eight to twelve hours. It likes dark damp corners and in such environment will live for months without losing its virulence. The bacilli may live for weeks or months in sputum. Because of this fact the dry sputum of consumptives is so infectious. You have often seen the sunlight floating through the window and noticed the tiny dust particles moving around in it. Several hundred bacilli can attach themselves to these particles and be inhaled while floating in the air. When a consumptive with a positive sputum laughs, coughs, or sneezes, very minute droplets are scattered about containing many of the bacilli. These settle in the carpet or dark places and may remain infectious for months. They can withstand the heat of 212° F. or the boiling point for one hour when in dried sputum. Carbolic acid, five per cent solution, added to sputum, requires twenty-four hours to kill the bacilli because of its slow penetration. The common house fly is a frequent carrier of tuberculosis but is not susceptible to the disease itself.

When inhaled into the lungs of a person run down from any cause these bacilli settle upon the walls of the tiny air sacs and find ideal surroundings to

Information for the Tuberculous

multiply and attack the delicate thin-walled cells.

Practically every organ and tissue of the body may be invaded by the tubercle bacilli and they may be carried to all parts of the body by the blood. Wherever they grow they form characteristic small nodules or tubercles which give the disease its name. These tubercles are the size of millet seeds when first visible to the naked eye, but they may be sown so thickly that they form a larger tubercle which after several weeks softens and breaks down. It is then when the new bacilli formed are poured out into the sputum that the tuberculous are so dangerous to others about them unless they take measures to control the distribution of the bacilli. After this stage of softening which gives the characteristic râle you hear so much about, the tubercle undergoes healing in much the same manner as healing takes place anywhere from an injury: scar tissue of delicate fibrous strands grows in and replaces the destroyed lung tissue, the blood destroys and carries off the dead bacilli, the sputum whose quantity slowly decreases becomes negative, and other symptoms gradually subside.

CHAPTER III

SECONDARY ORGANISMS COMPLICATING PULMONARY TUBERCULOSIS

Besides the tubercle bacillus, other bacilli or rod-shaped bacteria as well as the various pus-forming bacteria of the cocci or disc-shaped group are found in the sputum. Recently the role of these organisms has been studied and it has been found that they may play a very important part in infections of the lungs. They may be the primary invaders predisposing lung tissue to infection with the tubercle bacillus or they may follow upon the latter and work hand in hand with it, aggravating the signs and symptoms and causing an infection of the lungs to be harder to overcome.

It frequently happens that one will have a chronic catarrh of the upper air passages. If the blood proves itself unable to combat the infection, these catarrhal bacteria gain a foothold in the larger bronchi and finally in the tiny air sacs themselves. They so weaken and lower the resistance of the lungs as well as the blood that when a person is exposed to the tubercle bacillus the latter readily gains a foothold. It is evident that they are the predominating infection in certain cases

Information for the Tuberculous

of pulmonary tuberculosis and they may produce the toxic symptoms to a large extent. Experiments in the laboratory by growing tubercle bacilli with these other bacteria have shown that the former will increase a million fold in the presence of the latter.

When the laboratory investigator wants to get a rapid luxuriant growth of tubercle bacilli, he plants them on a kind of media rich in the killed bodies of these other bacteria. And so it is in the lungs; if the secondary organisms are present, the growth of the tubercle bacilli is increased many times. When the tubercle is formed it is composed of a waxy-like mass which is thrown out into the bronchi and sputum in that condition or more often is attacked by these other bacteria present in the bronchial tubes and converted into pus, at which time the sputum is thick and may have a foul odor if there are putrefactive germs present. These secondary organisms are many and in ordinary routine examinations ten to a dozen different kinds have been noted. The severity of the infection would depend upon whether one or more of the secondary organisms were present.

By observing carefully the symptoms and physical signs of the patient one can to a degree determine the character of the secondary invading organisms complicating the disease. Some patients have marked symptoms of bronchitis or asthma

Secondary Organisms

when the physical signs are out of proportion to the former if all were caused by the tubercle bacillus alone. The temperature and pulse do not show the infection to be purely a tuberculous one. An ordinary "cold" frequently produces an increase in signs and symptoms of a tuberculous patient. The influenza bacillus provides a high temperature when present but very little sputum, and so on.

Vaccine treatment, by which comparatively few tuberculous patients are benefited, is frequently an effective means of freeing the respiratory tract of these secondary organisms. When the blood becomes flooded with the poisons from bacteria causing an infection many antibodies or soldiers of protection appear immediately and a fight commences between them and the invading army. If the infection is too overwhelming for these soldiers to conquer, the disease gains a foothold and runs its course. Working upon this principle, vaccines are made from the killed bodies of these infecting organisms and are injected into the body in the hope that they will call out enough antibodies to overcome the live infection existing. Patients suffering from catarrhal and asthmatic complications usually show marked improvement under such treatment by vaccine if it is used in connection with the regular regime of treatment for tuberculosis. Some such cases presenting marked catarrhal symptoms have been found on clearing

Information for the Tuberculous

them of the secondary bacteria with vaccines to take care of the tuberculous infection more easily. Tuberculin may be administered at the same time the other vaccines are given, but great care must be exercised in its use.

The use of vaccines is greatly abused at the present time for they are being given indiscriminately. They are very useful if properly applied but they are rarely if ever life saving. "They may hurry a stationary or languid process which tends toward recovery by bringing into play the unused reserves of various tissues" but rest, fresh air, and diet are absolutely essential for the successful treatment of all these infections.

CHAPTER IV

EARLY INFECTION

It is the opinion of many observers that a tuberculosis breakdown coming in adult or middle life is frequently the "lighting up" of an old healed focus which may have been the result of an infection received during the early years of life before the patient had reached the age of five or six years.* It has been shown beyond a doubt that many cases of the disease in early childhood especially of the glandular or serofulous type that have not received their infection from a consumptive parent or member of the family have resulted from the drinking of infected milk.

Many cases never go beyond this stage of infection which means that though the germs are able to get a temporary foothold in the body their progress is arrested and the focus of infection healed so quickly that no outward symptoms become evident and the person affected never knows that the infection and the healing have taken place.

*A child who has been exposed to tuberculosis should be examined every six months by a competent physician and should lead a life as much in the open air as possible under hygienic conditions and receive plenty of good nourishing food.

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But these slight healed areas or foci may remain latent for years to "flare up" and spread when the body's resistance has been lowered by illness, dissipation, overwork, worry, or exhausting physical exertion.

CHAPTER V

THE PROCESS OF HEALING IN THE LUNGS

Lung tissue that has been destroyed by the tubercle bacillus is not able to replace itself as the lung heals. The process of healing consists in the formation of scar tissue much like the growth of scar tissue in any other part of the body. This scar tissue is composed of delicate fibrous-like strands produced by certain kinds of body cells attracted to the tuberculous site of infection. These cells have minute tendrils or strands which attempt to surround the softened destroyed lung tissue, invaded by the tubercle bacilli, by uniting in bands and growing in an interlacing network through the destroyed areas in an attempt to replace them with a strong healing material. These scar tissue cells work hand in hand with other natural defenses of the blood which endeavor to kill off the tubercle bacilli by weakening and surrounding them.

The tiny tubercles that one sees in the lungs have many tubercle bacilli huddled together in their centers and consist of dead cheesy-like lung material which they have destroyed. These are encircled in turn by a wall made of many rows

Information for the Tuberculous

of certain types of blood cells which are striving to kill the germs. Following upon their heels come these fibrous-like cells with their long strands which grow into and surround the tubercle as the germs are destroyed.

Sometimes these tubercles are completely enveloped by scar tissue, the tubercle bacilli remaining inactive and imprisoned for years but ready to gain a foothold and recommence their work of destruction if the body defenses are lowered through exposure, carelessness, or neglect.

A person once healed from an active tuberculosis should never consider himself entirely free from living germs although if he takes a reasonable amount of care of himself and lives a hygienic life he can prevent their doing any more damage to himself and gradually lower their virulence. The fact that the lung tissue is not replaced by material of the same kind in healing should give no cause for worry because fortunately nature has supplied us with considerable more lung than is necessary to maintain life. It has been shown by experiments with animals that practically six-sevenths of the lungs may cease functioning without producing loss of life so that even if a considerable portion of the lungs has been replaced by scar tissue and a person is very short of breath as a result he may enjoy a certain amount of health. Although somewhat handicapped by the fact that

Process of Healing in the Lungs

the tissues of his body are not so well oxydized as if some of his lung tissue were not destroyed, he may, however, live the normal span of life, a self-supporting useful member of society.

CHAPTER VI

DISINFECTION

When one considers the fact that the tubercle bacillus is killed by direct sunlight in one hour and by diffuse sunlight in from eight to twelve hours, the necessity for fumigation in tuberculosis is not such an important one as it is for many other diseases. Fresh air and sunlight are death to the tubercle bacillus for it is one of the easiest destroyed germs when the waxy capsule that surrounds it is penetrated. This dissolution which is very readily done by the disinfecting rays of the sun, strong chemical agents often fail to accomplish easily especially when the bacilli are in purulent sputum where the chemicals tend to coagulate or put a coating on the particles of sputum sealing in the living germs so that they can not be acted upon readily. A patient living on a sunny airy porch or in a sun parlor has very few bacilli survive about him for any length of time.

The walls of a house in which a consumptive has lived are cleaned best by white washing, calcimining, papering, or painting. The woodwork and floors should be scrubbed with strong soap and water and all clothing (it is understood

Disinfection

that no curtains, tapestries or carpets should be used) boiled thoroughly. Clothing having been used by a consumptive should never be worn by others before boiling or hanging it outdoors in the air and sunlight for several days to clean it as well as possible. Separate dishes are best for the patient and they should be washed in hot soap-suds and water to which a little carbolic acid, formalin or other disinfectant is added, and then scalded.

Formaldehyde fumigation is still used extensively but unless it is very thoroughly done it is practically useless so far as killing the tubercle bacilli is concerned. At least a pint of commercial formaldehyde solution should be used for every thousand cubic feet of space. The doors and windows may be sealed by pasting with thin flour paste strips of paper over cracks. The clothing and other articles to be fumigated should be spread out so that as much surface as possible is exposed to the fumes. The solution may be heated over a flame or six ounces of permanganate of potash sprinkled in an old open pan for each pint of formalin or formaldehyde solution it contains. Burning sulphur is of no value.

In sanatoria the bed blankets are usually hung on the line for several days in sunshine and rain, the bed linen boiled, woodwork and floors scrubbed, and mattresses and beds exposed to the sun.

PART II

CHAPTER VII

REST

All other factors that tend toward the recovery of a tuberculosis patient sink into insignificance when compared with rest. Drugs, diet, climate, tuberculins,—all these will help only when used in conjunction with rest. Not only because it sounds like such unimportant advice but also because it is so difficult to follow, patients are inclined gradually to disregard it until serious relapses in their conditions make them realize its importance.

So early as 1875, the year that he first wintered at Paul Smith's in the Adirondack Mountains, Dr. Trudeau observed the value of remaining quiet in his own case although he did not publish that observation then. In the "Autobiography" we find this paragraph following his description of his fox and hare hunting:

"I found however I could not walk enough to stand much chance for a shot without feeling sick and feverish the next day, and this was the first intimation I had as to the value of the rest cure

Rest

which in after years I applied so thoroughly and rigidly to my patients. I walked very little after this, and my faith in the value of the rest cure became more and more fully established."

The necessity for the patient to have an abundance of fresh air was realized many years before it was discovered that rest in the open air was such a potent factor. When Brehmer, the German leader, in systematic treatment for tuberculosis, opened the first sanatorium for tuberculous patients at Görbersdorf in Silesia in 1859, he applied some of his observations previously made. Chief of these were the statements that living in the open air under certain conditions appeared to give immunity to tuberculosis and that methodical exercises, particularly hill-climbing, when the patient's condition permitted it, resulted in improvement. Up until 1887 he continued to prescribe hill-climbing as a means toward recovery for his patients.

A patient and assistant of Dr. Brehmer at Görbersdorf, Dettweiler by name, made some observations of his own about that time however. In his study of the patients being treated at the sanatorium, his attention was called to the fact that those patients whose condition would not allow them to undertake the strenuous work of hill-climbing but who remained quiet improved more noticeably than those who were exercising. Convinced that forced rest would do more for tuber-

Information for the Tuberculous

culous patients than any other treatment so far tried, he became the champion of that school, broke away from Brehmer, and established a sanatorium of his own at Falkenstein. There those of his patients who showed any fever lay all day long in comfortable cure chairs of his invention enjoying the fresh air. And that treatment resulted in Dettweiler's securing far more favorable statistics than any before compiled.

Why is rest so valuable to the tuberculous patient? When the various organs are functioning normally in a perfectly healthy body there is a balance of waste and repair maintained with a storing up of some reserve energy that may be drawn upon at some time when the organs are being overworked or when some or one of them may become diseased. When the tubercle bacilli gain a foothold anywhere in the body and begin their work of destroying tissue, the poisons produced as a result of this destruction must be taken care of by the organs in addition to the work they must regularly do, with the result that what reserve energy has been stored up is quickly exhausted and the organs are called upon to overwork constantly. Such overwork can only be followed by a weakening of the organs and a general inefficiency of their work which finally causes the outward signs or symptoms of temperature, rapid pulse, a feeling of languor and sleepiness, steady

Rest

loss in weight, and not infrequently, blood spitting or hemorrhage.

Exercise plays an important role in the ultimate recovery of a tuberculous patient but while the lung tissue is softening and breaking down and the blood is handling the toxins or poisons produced by that process, rest leads all other prescriptions that will aid toward recovery. You would not attempt to use a hand whose wrist was broken during the period of healing—then why insist upon overworking a diseased lung?

When remarking upon the value of sanatorium treatment for tuberculosis patients because there the value of rest is so forcibly emphasized, Dr. Latham said, "Fatigue kills the majority of consumptives and causes the frequent relapses of the disease."

Muscular weakness will surely follow a long period of enforced rest but it will not produce diseased muscles, and they can easily be exercised to a return of strength when the lungs have healed enough to permit bodily exertion without evil consequences.

CLOTHING

The patient should practice dressing himself properly until he knows what to wear in any kind of weather in order to be comfortable while staying out of doors for several hours at a time.

Information for the Tuberculous

Light underclothing containing some wool should be worn during the winter months. The outside clothing should be of seasonable weight and loose fitting. A robe or blanket made by interposing five or six layers of tissue paper placed alternately lengthwise and then crosswise between two large cotton blankets and secured with yarn placed in knots about four inches apart is very serviceable when fur robes can not be secured.

Footwear for cold weather depends upon the requirements of the individual. Woolen stockings worn over lisle ones and loose comfortable shoes may be all that are necessary. High arctics may be worn over the shoes. Men can tuck their trousers into their shoes or wear leggings or woolen puttees. Sheep skin shoes with the wool inside are warm and comfortable. Bags lined with cotton or paper may be worn as foot muffs. A jug of hot water may be placed at the feet in very cold weather.

For outside sleeping several firms make a very serviceable light one-piece sleeping-out garment which covers the head. Bed socks of light wool into which the pajamas are tucked may also be purchased. The pajamas should be of lightweight outing flannel.

CURE CHAIR

An uncomfortable cure chair should never be used because too much of the patient's time must

Rest

be spent in it. There are many styles of chairs on the market, the best being those supplied with springs and cushions that can be adjusted to allow the patient to sit erect, partially recline, or lie re-cumbent.

SHACK

A very excellent book for one to read who is contemplating building a shack, sleeping-out porch or window tent is, "Fresh Air and How to Use It," by Dr. Thomas S. Carrington, published by The National Association for the Study and Prevention of Tuberculosis through the Journal of the Outdoor Life Publishing Co., New York. It will save its cost many times to the builder.

It may be said that any arrangement which will allow the patient to remain out of doors in comfort in all weather and which protects him from exposure and the elements and allows the greatest circulation of air is the ideal plan. The material at hand, the environment and other resources should determine the nature of a sleeping-out porch.

DISTINCTION BETWEEN THE MEANING OF MUSCULAR POWER AND VITAL STRENGTH

When objecting to enforced rest for a long period of time many people in arguing that such treat-

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ment will weaken them physically confuse the meanings of the term vital strength with muscle power, when as a matter of fact they are very different and although every person should and as a rule does have a reasonable amount of both, the one may be present without the other. Sometimes athletes who have been under strenuous training for years and whose muscular strength has been developed to the highest efficiency will show very little resistance to disease and will succumb to the first attack by that invader. Then again it also sometimes happens that the office clerk who has worked under all sorts of disadvantages such as in dark, unhealthy, poorly ventilated rooms will have acquired enough resistance against disease or vital strength by accustoming himself to such surroundings to throw off an equally heavy infection with apparent ease.

Do not misunderstand this as a general rule, however, for usually the person with a strong healthy body will have vital strength or resistance to disease as well, but the patient does not need to feel any alarm when seeing his muscles become soft and flabby as the result of rest if he is taking care of his infection all right for he can very easily retrain them to their former power when he is allowed to exercise.

Rest

SLEEP

It is always best for the patient to sleep entirely out of doors if possible. If that is not practicable, the bedroom, which should have as many windows on as many sides as possible, should be so situated that the sun will reach it for a part of each day.

When sleeping or resting the patient may lie on the side which gives greater comfort. Sometimes this is on the side of heavier infection which helps to limit the motion of that side of the chest as well as allows free expansion of the opposite side. There is no danger of the disease spreading to the side of less infection as a result of one's lying upon it. It is best not to sleep with one's arms above the head.

No arbitrary bedtime for the tuberculous patient can be named although it should not be a very late one and should come at about the same time every night. Each patient should have at least eight hours sleep at night and many require far more. A good rule for him to follow is to go to bed at the time he seems most likely to sleep at once unless he has trained himself to rest without sleep so that he will not become restless by retiring at a time when he can not sleep. If troubled with insomnia he should consult his physician. It proves an interesting pastime to try training the

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mind to exclude all thoughts at once upon retiring so that sleep may result immediately. It is not necessary for the patient to sleep during his afternoon rest hour. Upon his ability to relax entirely and rest, frequently depends the patient's chance for recovery.

CHAPTER VIII

EXERCISE

To the tuberculous patient, exercise is of no less importance than rest with the very great difference that it requires its significance for him far later in the stage of his recovery.

While he is resting he is doing everything possible to help the organs of his body to take care of the poisons in his blood that are the outcome of the tissues' being destroyed and the activities of the tubercle bacilli. When the symptoms resulting from these increased bodily burdens begin to subside, it is time for him to consider exercising. To be specific, after the temperature and pulse have become practically normal, after the patient has stopped losing weight, when there has been no more streaked sputum for a time, if his was a hemorrhage case,—then he may begin to think of some exercise, trifling in amount though it may seem, to vary the monotony of constant rest.

Before even walking is allowed, the patient who has been taking the "cure" of enforced rest is permitted to get up and dress, first for one meal a day, then for two, etc. Only after he has been able to go to three meals a day for a while without

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any ill effects, is he allowed to walk for from three to five minutes daily providing his physician approves. During the period of walking the pulse will undoubtedly be faster than when resting and if it does not come down to its normal rate after one-half hour's rest following the exertion the patient is not yet ready to leave his "cure" chair.

A foot-pound is the amount of energy necessary to raise a pound one foot from the ground. It is estimated that with every beat of the heart it does about one and one-quarter foot-pounds of work. At that rate, if the pulse were only ten beats above normal per minute, in that time twelve and one-half foot-pounds of extra work would have to be done by the heart which would be forced to over-work to the extent of over a ton every three hours during the time of increased pulse beats. Considering the fact that the poisons flooding the blood during the time of an acute tuberculous infection put an additional strain upon the heart and produce a much increased pulse rate, is it not urgent for the patient to know how seriously even one act of overexertion may affect him? And is it not easy to understand why the patient with a rapid pulse complains of being fatigued at the end of a day in bed?

If his first trial does not have any noticeably unfavorable results, the time of walking may be increased gradually until the patient begins to re-

Exercise

gain his muscular strength and physical endurance to the degree where he will be able to return to some remunerative occupation with safety. But, if after exercise there should be any symptoms that tend toward relapse, such as fever or a marked increase in the rapidity of the pulse, it would be well for him to resume his regime of rest until the advice of a competent physician can be secured. When he is able to walk for two hours a day, one in the morning and one in the afternoon, without causing any disturbing symptoms, the patient ought to be in good condition to return to regular employment that is not of too strenuous a nature.

Doctors Lawrason Brown and Fred Heise of Saranac Lake give the followng rules to govern the exercise of the patient.

“Outdoor walking on the level is perhaps the simplest, safest and easiest form of regulated ex-ercise for the tuberculous.

“Walk slowly, never try to make time. Two miles an hour is a good rate.

“Walk uphill at the start so as to come down hill on the return, when weariness is more likely to occur.

“Rest at least one-half hour immediately before and after meals.

“Exercise systematically whether rain or shine.

“Time and not distance is the best measure; not how far but how long.”

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That exercise is an absolutely essential part of the treatment of tuberculosis when prescribed in fitting amounts at the right times, can not fail to be appreciated when it is considered that by a cautious and judicious practice of it after rest has satisfactorily accomplished its primary influence for the diseased body, the patient is gradually strengthened to the extent of finally being able to return to society in a useful wage earning capacity with a knowledge of a common and prevalent disease that gives him the ability to help those with whom he comes in contact to take precautions to maintain their good health.

The ease with which a mistake whose results are disastrous can be made when prescribing exercise surely causes one to realize how dangerous a thing it would be for the patient to undertake the care of his own convalescence without having his physician's assistance and advice. Without a guide, a map, or some means of gaining the necessary information you would not attempt to find any definite location that took you through the intricate and devious streets of a large and unknown city; then why endeavor to find health when recovering from a long illness, the seriousness of which you must acknowledge, by experimenting among the various paths of treatment of which you have heard vague rumors rather than trust to the safe guidance of your counselor and physician?

OCCUPATIONS FOR ARRESTED CASES OF TUBERCULOSIS

(By permission of the Journal of the Outdoor Life and W. J. Vogeler, M.D.)

HEALTHY		UNHEALTHY		TO EMPLOYER
HEALTHY	COMPARATIVELY HEALTHY	BECAUSE OF OCCUPATION	FACTORS CON- NECTED WITH OCCUPATION	
Artificial flower maker	Attendant in an Insane Asylum	Brakeman Bridge builder	Brewery hand Dyer	Child's nurse
Banker	Bowling-alley attendant	Caisson worker	Emery-wheel worker	Baker
Barber	Boxmaker	Canvasser	Garage	Hairdresser
Bone-carver	Braider	Car conductor	Gasworks employee	Fish cleaner
Bookbinder	Brass worker	Cigarmaker	Glassblower	Grocer
Bookkeeper	Bricklayer	Coalyard employee	Laboratory employee	Ice-cream vender
Bootblack	Brickmaker	Collector	Marble	Iceman
Broker	Cap maker	Constable	worker	Ice manufacturer
Broom-maker (Broom and brush maker)	Carpenter	Courier	Stone cutter	Milkman
Business man (merchant and dealer, retail and wholesale)	Carriage maker	Driver	Miner	Nurse
Butler	Cementer	Drayman	Pool-room attendant	Midwife
Buttonhole maker	Chemist	Horseman	Printer	Oysterman
Cabinet maker	Electrical worker	Teamster	Rag-sorter	Seamstress
Chair-caner	Elevator	Engineer	Reporter	Butcher
Chambermaid	Expressman	Farmer	Riveter	Candy-maker
Clergyman	Fireman (fireman and engineer)?	Hostler	Sailor	Cook
Clerk (clerk, copyist)	Gasfitter?	Huckster	Scissors-grinder	Druggist
Cloth examiner	Glazier	Inspector	Stage hand	Spice-room worker
Cooper	Gold preparer	Iron worker	Stone-cutter	Nurse
Coppersmith (copper worker)	Harness maker (saddle maker and repairer)	Janitor	Type-polisher	(trained)
Cutter	Houseworker	Junk dealer	Typesetter	
Decorator	Lamp cleaner	Letter carrier	Woolsorter	
Designer (architect, designer, and draughtsman)	Laundry worker (male and female)	Lineman	Winedealer	
Dressmaker	Masseur	Longshoreman	Detective	
Engraver	Mechanic	Lumber-yard employee	Hotel and boarding house keepers	
Embroiderer	Mill hand	Messenger boy	house keepers	
Factory hand	Molder	Motorman	Saloon and restaurant keepers	
Foreman (mill)	Oilworks employee	Mover	Livery stable keepers	
Gardener	Operator	Musician	Tobacco workers	
Hatter (hat and cap maker)	Packer	Navy employee		
Jeweler	Paperhanger	Painter		
Labeler	Penmaker	Peddler		
Labor boss	Pipe-cutter	Plumber		
Laborer (labor not specified)	Plasterer	Policeman		
Lawyer	Plaster-of-Paris worker	Porter		
Leather worker (currier and tanner)	Rubber-maker	Rigger		
Librarian	Sawyer	Salesman		
	Seamstress	Saleswoman		
	Statue-painter	Scrubber		
	Steamfitter	Shipper		
		Shipwright		
		Signalman		
		Soldier		
		Steel worker		

OCCUPATIONS FOR ARRESTED CASES OF TUBERCULOSIS—CONT'D.

HEALTHY		UNHEALTHY		
HEALTHY	COMPARATIVELY HEALTHY	BECAUSE OF OCCUPATION	FACTORS CON- NECTED WITH OCCUPATION	TO EMPLOYER
Lithographer	Stereotyper	Stevedore		
Locksmith	Terra cotta worker	Stoker		
Machinist		Street-cleaner		
Merchants and dealers	Tin-roofer	Street-paver		
Metal worker	Trunk-maker	Tool-sharpener		
Milliner	Waiter	Undertaker		
Morocco finisher	Washer- woman	Veterinarian		
Nickel-plater	Wheelwright	Window- cleaner		
Office-boy	Chicken- farming	Wood-chopper		
Officials of Co.		Lumberman		
Oilcloth worker		Raftsmen		
Optician		Miller		
Photographer		Auctioneer		
Physicians and surgeons		Vine-growers		
Picture-frame maker		Compositors		
Presser		Pressman		
Servant		Newspaper work		
School-child				
Shirtmaker (shirt, collar, and cuff mak- er)				
Shoemaker				
Springmaker				
Stand-keeper				
Stenographer (stenographer and typewrit- er)				
Storekeeper's employee				
Student				
Suspender maker				
Teacher (teach- er and pro- fessor in col- lege)				
Telegraph opera- tor (tele- phone and telegraph)				
Time-keeper				
Tin-plater (tin- plate and tin- ware worker)				
Tinsmith				
Truss-maker				
Upholsterer				
Violin-maker				
Watchmaker				
Weaver				
Woodworker				
Wrapper				
Chicken farm- ing				

Exercise

BATHING

Some years ago sun baths were advocated as important aids toward the recovery of tuberculous patients but their practice was soon abandoned especially in climates where the sun becomes very hot, for in such places it was observed that the patient suffered from an increased elevation of temperature and sometimes other alarming symptoms after he had been exposed to the hot sun for a while.

This method of sun bath should not be confused with the scientific one of applying systematic gradual exposures to the sun in high altitudes as practiced by Dr. Rollier, Leysin, Switzerland, in treating bone and joint tuberculosis. Remarkably beneficial results have been obtained by this means but it has not proved of special value in lung cases even under the most careful supervision.

Too many hot baths are harmful but from two to three tepid ones may be taken each week, evenings before retiring being the best time for them.

Many patients are unable to stand the daily morning cold sponges that are so beneficial if they do not produce discomfort, weakness, unhealthy color of the skin, blueness of the lips, etc. Some physicians advise salt baths as less likely to result in chilliness. Alcohol rubs following baths are excellent. Vinegar sponges and alcohol rubs will

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often considerably alleviate night sweats but if this condition is serious a physician should be consulted. Many so-called night sweats are not the result of the disease but of the patient's wearing too many clothes and bed clothes.

Bathing in salt or fresh water is not injurious, unless there is a tendency for the patient to have pleurisy or rheumatism, if he does not stay in the water longer than ten minutes and does not attempt to swim.

Frequent alcohol rubs greatly assist the patient to harden himself against taking cold. Their benefit to the bed patient in helping him remain comfortable is invaluable.

Electrical treatments consisting of "electrical baths" and other forms of using electricity have absolutely no value in the treatment of pulmonary tuberculosis. Vibratory massage may even prove harmful.

The tuberculous patient should never take Turkish baths even after his case has been pronounced arrested.

CHAPTER IX

DIET

The value of a bountiful supply of good nourishing food in tuberculosis was recognized long before rest as a factor in effecting a cure. Even today it is a fairly common belief that "stuffing" with food is of the greatest importance in combating the disease.

Let us discuss briefly what food is and the principles of nutrition in health and disease. The balance of waste and repair is normally maintained by the assimilation of enough bodily fuel or food not only to make up for the sum total of the body's daily physical energies expended but also to cause enough reserve energy to be stored up which may be drawn upon if necessary without depleting the original strength of the tissues. When food is taken into the digestive tract it undergoes a breaking down process into its simplest elements before it is taken up by the blood and body tissues and again built up into new material essential for the repair of the various organs of the body. This process is very much like the tearing down of a stone wall or building into building blocks which are set up with new cement or mortar into the mak-

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ing of another building. These building blocks or all food taken into the body go to make up three great groups, namely: carbohydrates, consisting of starches and sugars; the fats, both animal and vegetable; and the proteins or tissue builders, such as meat and eggs.

Energy is expended by the body in the form of muscular work which includes not only all forms of daily exercises but also the process of digestion and the functions of the various organs of the body as well. This expended energy is manifested in the form of heat which radiates from the skin and is exhaled from the lungs, just as fuel like oil or coal is converted into energy by burning in an engine. This is a chemical change and is called combustion. Since the energy liberated in the form of heat by the combustion of these three great food groups can be determined outside of the body by means of special apparatus, it has been made possible to fix the relative food values of most edibles and the quantity necessary to take not only in health to maintain a reserve supply of energy beyond that necessary to repair the waste but also in diseased processes where the combustion exceeds the normal and there is a process of depletion requiring extra nourishment to compensate the condition.

It was convenient to have a standard or unit when the relative food values were determined by

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burning them and measuring the amount of heat liberated. A heat unit was called a calorie or the heat liberated on burning any substance sufficient to raise a liter (approximately one quart) of water from the freezing point to one degree higher on the centigrade scale or one and eight-tenths degrees higher on the Fahrenheit scale. It was found that a gram (one-thirtieth of an ounce) of either carbohydrate or protein would liberate about four calories of heat and the same amount of fat, about nine calories.

One of the marvels of the human mechanism is its power to maintain under all conditions what may be called normal, a constant temperature. This is so constant that any alteration of the body temperature is an indication of an abnormal or diseased process.

Not considering the energy expended during the ordinary working periods but merely to keep the average warmth of ninety-eight degrees for the body requires in a day and a night from ten to fifteen calories of heat per pound of body weight. Thus a person of the average weight of one hundred and fifty pounds ought to have while resting, at least two thousand calories per day, the amounts needed above this depending upon his activities or energy expended and his environment. A hard working laborer under ordinary conditions requires about three thousand calories; in other

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words, to maintain bodily health he would have to eat enough food in every twenty-four hours the sum total of which food value would be three thousand calories.

Many tables and statistics of food values have been published (write the Bureau of Agriculture, Washington, D. C.) but for practical purposes, it is only necessary to acquaint oneself with the foods that are most nutritious and relative portions required of each.

The tuberculosis toxins or poisons have an injurious effect upon all parts of the bodily structure but especially on nervous and muscular tissues so that the nervous control of the secreting glands of the digestive tract are impaired and there is a tendency to incomplete digestion and consequent poor assimilation of foodstuffs. The rising temperature or fever and the fast pulse produce increased combustion of the tissues so that there is a utilization of the reserve energy and a consequent loss in weight and decrease in bodily functions, which is just what is not desired. The consumptive must aim to digest and assimilate as much food or more while at rest as the healthy laborer does when at full work. The food intake can not be altogether guided by the appetite. The latter is essential to call forth the ferment containing juices of the mouth and stomach but these organs serve to prepare and act as a reservoir for

Diet

the food more than the actual process of digestion. Fully two-thirds of the food digestion is done in the intestines, which are not under the control of nerves to the same extent, so that food which does not appeal to the appetite is frequently digested.

A number of foodstuffs contain all three principal elements of nutrition such as many of the vegetables. Certain foods as milk and milk products are absorbed more completely than others and the percentage of waste is considerably diminished. Whatever is gained in digestibility in this way favors the retention of food materials for the making of living tissue and body fat.

It does not pay to eat food to excess for the dangers of overfeeding are almost as great as those of underfeeding. Raw eggs if taken in great numbers produce biliousness and are harmful in other ways. A glass of ordinary milk containing the average percentage of cream has more food value and is more digestible than two raw eggs. Fats if they can be digested by the patient are valuable in tuberculosis. They are broken down and reconstructed in the body very much like the proteins and it is probable that they play a special role in this disease. Persons who can assimilate fatty substances like bacon, butter, etc., seem to stand a better chance in the fight than those who can not do so. If this ability is lacking every form of animal fat and vegetable oil should be tried in the

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hope that one will be tolerated. Carbohydrates, especially sugars, are valuable in any condition where there is wasting of tissues because they are assimilated easiest and reach the point of combustion in the cells earliest. They also act as supplementary builders to the proteins. In fever, carbohydrates should be given plentifully because they give to the body less free heat than any of the foods. Ordinary sugar if too sweet may be replaced by milk sugar and malt sugar or glucose.

Remembering the principle on which his actual needs are based, the patient, with a little careful study can regulate the amount of food to his needs. He should keep a weight chart and be guided by it. So long as he is gaining slowly and steadily up to his normal weight while in health he is getting enough food and need not take lunches between the three meals. When the normal weight is reached or a few pounds in excess his aim should be to hold it there. Nothing is gained by putting on a large amount of extra fat which will probably be lost on the resumption of active work.

Cheerful conversation at meals assists digestion. Always eat slowly and chew the food thoroughly and drink plenty of fresh water between meals.

LIST OF FOOD THAT MAY OR MAY NOT BE TAKEN

Following is a list of foods permissible and those forbidden in tuberculosis, taken from Friedenwald

Diet

and Ruräh's book, "Diet in Health and Disease."

May take:

Soups—

Bouillon, soups made with milk, clam or oyster broth, chicken, beef, rice, tapioca, or vermicelli broth.

Fish—

Fresh fish of all kinds, as mackerel, trout, perch or oysters.

Meats—

Raw beef, rare beef, steaks, chops, roast beef, roast mutton, lamb chops, chicken, turkey, fresh game, bacon, ham, Mosquera's beef meal, beef-juice.

Eggs—

Raw, poached, boiled, scrambled, or omelet.

Vegetables—

Spinach, cauliflower, asparagus tops, peas, green string beans, lima beans, lettuce, cresses, celery, baked, mashed, or creamed potatoes, onions, tomatoes.

Farinaceous Foods—

Bread, graham bread, toast, milk-toast, zwieback, pulled-bread, oatmeal, rice, grits, hominy, corn meal mush, barley gruel.

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Farinaceous foods should not be taken in too large quantities.

Fatty Foods—

Cream, butter, olive oil, cod liver oil, extract of red bone marrow.

Fruits—

Oranges, lemons, raw, baked, or stewed apples, grapes, stewed apricots, pears or prunes, raw or stewed peaches.

Desserts—

Blanc-mange, custards, tapioca, sago, bread or rice pudding, farina, wine jelly, junket, cheese.

Drinks—

Water, carbonated water, milk, butter milk, peptonized milk, kumiss, kefir, whey, cocoa, chocolate, albumin-water, grape juice, Vichy.

Must not take:

Excesses of starches and sugars, pork, veal, hashes, twice-cooked meats, potted meats, liver, kidney, salt fish, smoked fish, lobster, hot bread and cakes, fried foods, pies, pastry.

CHAPTER X

SYMPTOMS OF TUBERCULOSIS

ORDINARY SYMPTOMS OF ACTIVE DISEASE

The seriousness of a case usually depends more upon the general symptoms than upon the character of the lesion. Symptoms of active disease are fever, fast pulse, sweats, weakness, loss in weight, sleepiness, cough, indigestion, etc. Frequently a patient shows only one or two of these symptoms at first. The disease may sometimes be active when the temperature is normal but seldom is so. No coughing and expectoration are favorable symptoms although their presence does not necessarily indicate that the disease is active. The length of life does not depend upon which lung is affected.

BURNING AND FLUSHED FACE

When the face burns and is flushed and yet the temperature is normal, the nervous system is disturbed.

CHEST SENSATIONS

Various sensations in the chest are frequently due to reflex nervous irritation.

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HOARSENESS

Persistent hoarseness or loss of voice calls for immediate special treatment. The patient can assist the physician greatly by adhering to the advice given. He should not talk any more than is absolutely necessary and it is better to whisper than to speak aloud until the condition subsides. Such a symptom in a case with very early lung involvement is not so serious as in an advanced case.

INDIGESTION

It sometimes happens that the earliest symptoms of tuberculosis are manifested by attacks of indigestion with few or no symptoms referring to the chest so that suspicion is directed from the real cause. A thorough chest examination should be received by every person who shows a persistent indigestion with loss in weight.

WEIGHT

Continual loss in weight is a condition whose gravity should never be overlooked. Increase in weight does not necessarily mean improvement in the lung condition although it is usually a favorable sign and indicates lessened poisoning of the system. In some cases the lung condition remains stationary and in a few cases the disease may even slowly progress in spite of increased weight. In

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the latter case, however, there would be some other signs of increased disease.

DIARRHEA

Diarrhea in tuberculosis may be caused by changes in climate, water, and food, by indiscretions in diet, by the poisons of the disease producing intestinal indigestion or by actual tuberculous ulceration of the bowel. Because of the seriousness of this last named condition a diarrhea should always receive immediate attention so that the diet may be modified at once. Precautions should be taken against the use of laxative fruits and cold drinks. Milk should be heated and a little lime water added before drinking. Foods that are not bulky but nutritious as pureé of vegetables, hominy, rice, toast, eggs and cocoa will correct diarrhea entirely unless it is tuberculous and in that event will aid considerably the treatment prescribed by the physician.

ACIDITY OF THE STOMACH

Another condition that sometimes arises in cases of tuberculosis is increased gastric acidity producing sour eructations from the stomach which highly seasoned foods and acid fruits aggravate. Salt should be used sparingly at such times, meats should be prepared by stewing or broiling, and lime water should be taken in both milk and water.

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DIET AND HIGH FEVER

When the disease is advanced and there is a continual high fever a two hour semiliquid diet is frequently beneficial.

ANEMIA

Anemia or the condition existing when the blood lacks the oxygen-carrying agent that is necessary for the body cells to perform their functions and combat disease, frequently accompanies tuberculosis and may be largely responsible for the feeling of great lassitude of which so many patients complain. Eating green vegetables and rare meat will help remedy this condition. When serious, there is a special treatment for it that can be administered by the physician.

CONSTIPATION

A tendency to constipation should be reported to the physician so that this condition which the sedentary life of the patient on the "cure" is very likely to promote may be remedied at once. A patient may often correct this inclination by the natural means of drinking buttermilk and of eating honey and plenty of fruit particularly oranges, bananas, apples, stewed prunes, figs, and dates. Grape juice or a little senna tea sometimes proves a good laxative. The habit of accustoming the bowels to

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move at a certain time each day has more value than many people realize. Care should be exercised not to attempt assisting bowel movements by straining. The blood pressure is always considerably higher than usual at such times and such conscious efforts may cause injurious effects such as hemorrhage.

PLEURISY

The pleura is a thin serous membrane lining the chest wall and is reflected over the lungs completely enveloping them in a closed sac called the chest cavity. If there is tuberculous involvement of the lung near the pleural surface there may be an extension of the inflammation to this thin membrane and this is called pleurisy or pleuritis. Inflammation of the pleura may be one of the earliest signs of a tuberculous process in the lungs and may serve to call attention to their condition. Not all pleurisy is tuberculous. It may complicate pneumonia or be caused by the ordinary pus-forming germs just as any other tissue can be attacked by them when the vitality is low. A slight pleurisy coming on insidiously without any apparent cause and showing a tendency to recur or become chronic is very suspicious of tuberculosis.

The most prominent symptom of pleurisy is "stitch in the side," particularly when one breathes in, which seems to hold the breath. Sometimes the

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pain is of a dull aching character and may be felt across the back, between the shoulders, about the sides of the chest or across the front. The pains of pleurisy may be referred in the chest, i. e., the pain may be in one place and the inflammation in another. More often the pain is sharpest over the spot of greatest inflammation. The pain is caused by the pleura which lines the chest wall rubbing against the inflamed pleura covering the lung. The chest wall pleural surface is richly supplied with sensory nerves from the intercostal nerves so that the pain may be like an intercostal neuralgia. If the pleurisy is severe there is usually fever together with a sharp pain, a cough and shortness of breath. A pleurisy is dry, and this kind generally causes the most pain, when the inflamed surfaces do not pour out a watery serum. If fluid forms it collects in the chest cavity where the physician recognizes it by certain signs and symptoms after which he draws it off by tapping.

Rest is the first essential treatment for pleurisy. Fresh air, particularly out of doors, is very good because a patient breathes more slowly and secures sounder sleep. A tuberculous person should always be more careful than a healthy one in avoiding exposure to cold, overexertion, or exercises that subject him to injury. Hot or cold applications are applied to the chest, but it seems to be the experience of the majority of physicians that for a

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tuberculous pleurisy hot applications produce the greater relief and cause less shock and discomfort to the patient. If the pleurisy is in the lower part of the chest a broad band of adhesive plaster drawn as tightly as can be borne comfortably often gives great relief. Painting the chest over the parts of greatest pain with tincture of iodine or with an ointment that "heats up" the skin sometimes helps. In all cases the physician should be consulted as soon as possible.

HEMORRHAGES

The gravity of hemorrhage from the lungs depends upon the amount of blood expectorated and the stage of the disease. Frequently it is the first symptom, when it is due to congestion around the point of beginning disease or to the rupture of a small blood vessel whose wall has been weakened by the disease. An early slight hemorrhage may be life saving by drawing prompt attention to the lung trouble so that treatment may be started at once. At this time there may be an outpouring of the infecting germs. Slight or moderate bleeding in advanced cases is due to the same reason and if accompanied by fever it is of considerable significance. In the latter case it may mean that the irritation has stimulated the disease to greater activity than formerly or has spread the infection to a healthy portion of the lung. A slight

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hemorrhage without fever has little or no effect on the progress of the case. Large hemorrhages are always serious because they greatly weaken the patient and may mean the rupture of a larger vessel whose bleeding is not so easily controlled.

Necessary precautions that should be taken after a hemorrhage from the lungs are: absolute rest in bed, be as quiet as possible, do little or no talking, sip an occasional pellet of ice if available, abstain from food and hot drinks, place an ice bag over the heart if inclined to be nervous and if there is no pleurisy, consult your physician at once. In order not to increase the volume of blood more than is necessary during the period immediately following hemorrhage it is wise to limit the amount of liquid taken to the extent of being consistent with comfort. Milk and broths are then preferred to water as being more nourishing. Steaming hot foods and drinks should always be avoided by the patient showing a tendency to hemorrhage and he should remember that all activities which would result in highly increased blood pressure are forbidden.

Extreme cold weather may cause a chronically inflamed mucous membrane of the nose to bleed which may be drawn back into the throat before expectorating. In all doubtful cases it is best to take all the precautions necessary after a hemorrhage from the lungs.

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Bleeding and spongy gums are a frequent accompaniment of tuberculosis so that when the sputum is blood tinged it is well to be careful about ruling out such sources of hemorrhage.

CHAPTER XI

TEMPERATURE

The normal limits of mouth temperature are from 97.1° to 98.6° Fahrenheit scale, and from 36.2° to 37.0°, centigrade scale.

The normal limits of rectal temperature are from 97.9° to 99.4° Fahrenheit scale, and from 36.6° to 37.4° centigrade scale.

The average rectal temperature is from four to eight-tenths, Fahrenheit, higher than mouth temperature which it seldom exceeds when a person is resting. The range between morning and evening temperature is significant: if the morning rectal temperature is higher than 99.0° F. or 37.2° C., rest in bed is advised; and if the afternoon temperature, whatever it may be, exceeds that of the morning by 1.5° F. or 0.8° C., the patient should rest in bed for a few days.

FEBRILE OR FEVER TEMPERATURE WHICH ALWAYS INDICATES REST

	RECTAL		
	7:00 A.M.	4:00 P.M.	8:00-9:30 P.M.
Fahrenheit, above	98.6°	99.4°	99.0°
Centigrade, above	37.0°	37.4°	37.2°
MOUTH			
Fahrenheit, above	97.8°	98.6°	98.2°
Centigrade, above	36.6°	37.0°	36.8°

Temperature

To convert Fahrenheit temperature to centigrade, subtract 32° from the Fahrenheit temperature then divide the result by 1.8; to change centigrade temperature to Fahrenheit, multiply the centigrade temperature by 1.8, after which add 32° to the result.

THERMOMETER

It pays to have a reliable thermometer and one that has been carefully tested and "certified" by its manufacturers. To clean a thermometer wash thoroughly in cold water then let stand at least five minutes in five per cent formaldehyde solution.

CHAPTER XII

PULSE

The average normal pulse in man is 78 beats per minute; in woman, 82. Rest is indicated for those whose pulse rate generally runs higher than 90 after remaining quiet a half hour.

Patients are continually asking, "Is 82 pulse normal when I am standing or sitting or should I be lying down to consider it normal at that?"

The pulse of a healthy or normal person sitting, standing or at light work should not exceed 90 beats per minute. On suddenly arising or after violent exercise the normal pulse may be rapidly increased but it returns to normal after resting by sitting or lying down for a half to three-quarters of an hour. The pulse frequently will not return to normal as quickly if one reads during the time of resting after exercise.

For every degree's rise in temperature there is an approximate ten beat per minute increase in the pulse rate.

When there is a fast pulse rate and the temperature is not correspondingly high some physical condition exists about which a physician should be consulted.

CHAPTER XIII

CLIMATE

The three cardinal principles in the treatment of tuberculosis are generally acknowledged to be rest combined with closely regulated exercise, fresh air, and food. We have discussed the value of rest and learned that the tuberculous patient can not be cured without it; we have explained the material gain made by the convalescing patient when using exercise properly; we have studied food and found out what kind of nourishment best stimulates and keeps in repair the body in which the tubercle bacilli are at work; and now let us see what assistance fresh air and climatic conditions will render the patient in his struggle for good health.

When studying the anatomy and the physiology of the normal lungs we learned that there are about six hundred million tiny air sacs in them, whose lining is one-tenth the thickness of ordinary writing paper, that if they could be spread out over one surface they would cover a room almost fifty feet square; also that between these air cells there are enough tiny blood vessels or capillaries to carpet a hall about fifteen hundred feet square. In

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other words, there is a huge sheet of thin membrane in the lungs which has air on one side of it and blood on the other side of it, there being a constant interchange of gases between the two; the blood giving up the products of combustion or waste in the form of carbon dioxide gas and the air giving up its oxygen to the blood. That an enormous supply of pure air is required will be realized more readily when one reviews the fact that the lungs handle or exchange one hundred and five barrels of air and one hundred and twenty-five barrels of blood every twenty-four hours.

The essential constituents of atmospheric air are oxygen, nitrogen, and carbon dioxide. The respiration air varies greatly under different conditions. The outside atmosphere free from dust, smoke, noxious vapors, and other impurities is the ideal air for the lungs' use. It contains approximately twenty per cent oxygen of which only about one-fourth is absorbed by the lungs when inspired. The carbon dioxide exists in much smaller amounts or less than one-half per cent. When the respiration air enters the normal lungs it gives up nearly five per cent of its oxygen to the blood and removes a slightly smaller amount of carbon dioxide resulting from oxidation of the tissues. The lungs also throw off considerable moisture. The presence of too much carbon dioxide in the air, unless in good circulation, and insufficient oxy-

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gen is very undesirable. In crowded rooms or even cities the air naturally contains less oxygen and more carbon dioxide. In addition the atmosphere becomes warm and contains more moisture, a condition which prevents loss of heat from the body and produces a fever temperature. Odors from material given off by the skin in the perspiration, etc., are present in crowded rooms. There is also much more germ laden dust in city districts. Hospital surgeons in cities must take extra precautions in sterilizing everything they touch in their operating rooms. In the mountain woods surgical operations are frequently performed where no such precautions are available and yet the wounds heal because the air is practically free from all infecting pus organisms.

In chemistry there is a phenomenon known as allotropism or the property of certain elements of presenting themselves in two or more different forms, thus diamond, graphite, and charcoal are chemically the same. Ozone is an allotropic form of oxygen, it is triple oxygen. Many fake companies exploit ozone machines for consumptives claiming that the "cure" may be taken at home with one of these oxygen-making machines. But ozone is a very irritating gas which causes the mucous membranes to become inflamed and which has no healing properties. It is thought that the air in the vicinity of the balsam trees such as fir,

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spruce, hemlock, pine, etc., has special healing properties because the different extracts obtained from them are used in various diseases. It is doubtful whether the air in their vicinity would have a healing effect, although it does seem to be clearer, freer from dust and germs, as well as to contain less moisture. The odor of the pines also is agreeable to most people.

Cases of tuberculosis have been known to heal in every climate although the pure fresh air of the country and a favorable environment are certainly more conducive to that end than the dusty, smoky air and the crowded built-up surroundings in large cities. Some tuberculosis specialists declare that permanent "cure" may be secured quicker and with fewer risks of relapse in certain localities but even this is questioned by others. The people of the southwest maintain that their dry, warm climate is more healthful; the physicians of the far north claim that the cold, dry air of their region is best; while the sanatoria physicians of the temperate climate assert that extremes in climate are harmful. So early as 1840, George Bodington, a physician from a small English village, wrote when describing the treatment for tuberculosis:

"To live in and breathe freely the open air without being deterred by the wind or weather, is one important and essential remedy in arresting its progress."

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He also made the observation that cold air was not injurious to the tuberculous lung; "The cold is never too severe for the consumptive patient in this climate; the cooler the air which passes into the lungs the greater will be the benefit the patient will derive."

There are enthusiastic advocates for almost every known altitude and climate. There is no ideal climate to suit all patients and each case should receive individual consideration. Some inland climates such as the Adirondack Mountains, the Carolinas, and portions of Arizona, New Mexico, and Texas in this country, and Muskoka and Western Alberta in Canada, are known as invigorating; others, especially the mountain regions of Colorado, Banff, Mexico City in America, and Davos in Switzerland are stimulating; while the coast climates are more sedative and not particularly suitable for the treatment of tuberculosis. However, many patients have been known to recover at the coast when other conditions have been ideal. If improvement seems to be at a standstill and the patient is able to be about so that he can stand the trip, to make a change often seems to help toward his ultimate recovery. But if a patient has succeeded in arresting the disease in one climate it is usually best for him to continue to live there. The patient who has become healed in the southwest would be likely to find difficulty in remaining well through severe

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northern winters and the one who recovered while roughing the hard northern winters would find the southern climate unhealthful. This does not mean that the patient must remain in the same locality in which he took the "cure." That would become depressing. However, if a patient has taken the "cure" in a sanatorium near his home town or city there should be enough diversion on his return to remove any depressing effects. There is nothing so sad as to see a "climate chaser" roaming from one part of the country to another trying to find the magic climate that does not exist.

Many patients improve steadily while living in high altitudes but the majority do not get the best attainable results in such elevations where there is considerable cold weather, high winds and snow in the spring and autumn months as well as in the winter. The patient is supposed to live in the open practically all the time and for many phases of the disease these would be unfavorable conditions. For those with throat or laryngeal complications, with serious heart trouble, or for those weakened patients with lowered vitality, the less vigorous and more equable climates of lower altitudes are more conducive to recovery. The patient should aim to get the greatest amount of pure outdoor air day and night in all seasons. Night air used to be almost superstitiously avoided by the sleeper when the fact is that it is the purest form of air in the

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cities because it contains much less dust. Sanatorium or hospital care under routine discipline is better for the patient who is going to shirk sitting out in zero weather because of the discomfort.

The commonly accepted opinion today of the climate most favorable for recovery is ably summarized in the words of Dr. Adolphus Knopf:

"In spite of our conviction that there is no specific climate for any type of tuberculosis it would be folly indeed to underestimate the value of certain climatic conditions which the accumulated experience of many years has shown to be advantageous in the treatment of tuberculosis. There does not exist a specific but there does exist an ideal climate for tuberculosis, and it can be described in a very few words: where there is the least dust and most freedom from smoke and noxious vapors in the air; where the temperature and general atmospheric conditions allow the patient to remain outdoors the greatest number of days out of the year, and the greatest number of hours out of the day, with the greatest possible comfort and enjoyment—that is the ideal climate for the tuberculous invalid."

CHAPTER XIV

TUBERCULIN

Before discussing the subject of tuberculin treatment, it will be necessary to give a brief history of its origin and inception. Robert Koch announced his discovery of the tubercle bacillus before the Berlin Physiological Society in 1882, and two years later in a paper that became one of the classics in medicine, told of his wonderful researches in discovering the cause of the disease. He showed that all forms of tuberculosis in the lungs, bones, glands (scrofula), intestines, skin, etc., in man, cattle, or swine were caused by the tubercle bacillus. He also showed us how to stain and recognize them in the sputum and diseased tissues and demonstrated beyond all controversy, their infectious and communicable nature. At once, investigators thought they would find a specific cure for tuberculosis by means of a vaccine or antitoxin.

Further study showed that there were different types of the germ for different kinds of animals. Rivolta found a particular type for birds. Theobald Smith in 1898 in this country showed that the type producing tuberculosis in cattle varied from the human type. It was also found that these dif-

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ferent types were incapable of causing the disease in an entirely foreign species or at least only in a modified or mild form. The kind of tubercle bacillus infecting birds is practically harmless for mammals such as cattle, sheep, etc. The cattle or bovine type is very infectious for cattle, sheep, hogs, rabbits, and guinea pigs, not so much so for man, but more so for man than the human type is for cattle. The bovine is more infectious for humans in infancy and early youth than for them in adult life. The human type causes severe disease in man, guinea pigs, and swine. As stated above, the cow is much more immune to this form and this also applies to rabbits. Birds do not become infected with the human type.

Many attempts have been made and are still being made to raise the resistance or immunity of individuals against the attacks of the bacillus by artificial means. Of course, the ideal way to wipe out disease would be to prevent infection. Experiments in small localities have been carried out and are now under way showing that this is possible. There are three forms of immunity or resistance possessed by a person against disease. First, there is the natural or inherited resistance, for instance typhoid fever can not be given to fowls, cats or dogs nor is man susceptible to chicken or hog cholera. Then, there is the immunity acquired by exposure to certain dis-

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eases, such as the resistance offered by a person to measles and scarlet fever after one attack. The other form of immunity is the artificial production of resistance in an individual against a definite disease. Many attempts have been made to use this method to prevent tuberculosis.

To American investigators belongs the credit of first making use of a vaccine composed of unchanged living bacilli of a foreign species with the hope of raising this immunity without producing any more disease. Dr. E. L. Trudeau of Saranac Lake in 1892 announced that rabbits that had received preliminary injections of living bacilli of the bird type showed much less damage to the tissues after later being inoculated with the human virulent type than animals not so treated. These experiments demonstrated the fact that a particularly harmless germ confers increased resistance to a harmful one, as Pasteur had proved to be true in other infections fifteen years earlier. A few years later, de Schweinitz at Washington, D. C., reported good results in guinea pigs and cattle after injecting a weakened or attenuated form of human bacilli. These encouraging reports caused many brilliant investigators to make numerous and varied experiments on a method of conferring immunity against tuberculosis. Neufeld, an associate of Koch, and von Behring, the discoverer of diphtheria antitoxin, both attempted to immunize cattle

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against their own type by previous injections of the living human form of the germ. The results of these investigations showed that a high resistance could be raised in cattle against their own type of germ that lasted from six months to two years after which the animals became as susceptible as ever to infection.

Koch, meanwhile, was conducting experiments of his own following his original method as he had used it in the cure of swine plague. This consisted in taking a culture of the human type of the bacilli grown on broth and filtering it or separating the bacilli from the broth media. This broth rich in substances from the tubercle bacilli was thickened or condensed by evaporating with heat after which glycerine was added. The solution thus obtained was reinjected into the human individual. This was the first tuberculin. This principle of using weakened or attenuated virus is employed successfully against such disease as smallpox, anthrax, and hydrophobia. Trudeau and de Schweinitz used germs that had become attenuated by long and repeated culturing in test tubes on artificial media or culture soil. The degree of immunity seemed to depend upon the virulence of the germs and so the ideal vaccine would be one containing bacilli that would be absolutely harmless for a person under all circumstances and yet one that would protect against virulent infection.

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The use of living germs in cattle was disappointing because it would occasionally produce abscesses and the bacilli would be found in the milk of the cows for weeks afterwards. The hunt continued for a germ that would fulfill the requirements. Dr. Lydia Rabinowitsch under Koch in 1897, found a bacillus in butter which has many characteristics in common with the tubercle bacillus. Dr. Alfred Moeller of Görbersdorf Sanitarium, Germany, obtained similar bacilli in timothy grass and manure. All these apparently harmless bacilli produced characteristic tubercle-like nodules but no tuberculous disease. These false tubercle bacilli were very disappointing as they did not seem to confer any immunity.

Meantime in 1889 Sibley reported finding a new type of harmless tubercle-like germ in a snake. Later, other investigators found similar germs in other cold-blooded animals as frogs and fish. These all failed to produce tuberculosis in warm-blooded animals and vice versa, the tubercle bacilli of warm-blooded animals would not cause the disease in the cold-blooded ones although they could harbor them for some time. Moeller tried to reculture the human germs inoculated into cold-blooded animals thinking they would make the long sought vaccine. Trudeau repeated the experiments but showed discouraging results. Weber and Taute working for the German government did a very complete and

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extensive set of experiments with these cold-blooded bacilli and reached the conclusion that they were very similar and correlated to the forms of the timothy and butter bacilli and not a distinct group.

In spite of these findings one of their own countrymen, Dr. F. F. Friedman of Berlin, who had made the claim two years before of discovering a distinct form of tubercle bacilli producing tuberculosis in turtles, made startling statements to the medical profession and the public as to the curative effects of his "serum" for tuberculosis made from the turtle bacillus. The result of this exploit for commercial purposes is all too well known for further comment. However, had the public been informed of the work of previous investigators along this line they would not have been so easily the victims of fraud.

The search still continues by earnest and skilled men. The question of immunity has proved itself to be a very complex one, and recently the trend of investigations seems not the use of living or dead virus for a vaccine but of distinctive parts thereof, or theoretically, to find the chief generator of resistance of the virulent bacilli and exclude the other portions as unimportant and therefore interfering with the real immunizing process.

There are many tuberculins on the market which are either solutions or suspensions in fluid rang-

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ing from Koch's Old Tuberculin or O. T. to all sorts of modified tuberculins or vaccines. Some physicians claim that one or the other produce more favorable results for them chiefly because their preferences are based on the continued use of one kind that they are unwilling to replace with another. Koch's tuberculins, O. T. and B. E. (bacillus emulsion), seem to survive as the favorites of many excellent physicians because they are simple and efficient. The claim so far for the superiority of one tuberculin over another is unwarranted.

What have been the results of tuberculin treatment in the past? For our purpose it will be sufficient to summarize in one statement the rough or general conclusions of statistics collected by men who have made careful and accurate observations of many patients over a long period of time. After reviewing the statistics of Dr. Lawrason Brown from Saranac Lake, Dr. Hamman of Baltimore said, "These statistics indicate that on discharge the incipient cases have done somewhat better than those receiving no tuberculin, while the moderately advanced cases show much better results. The ultimate results do not show such marked differences, but indicate that the treated, both incipient and moderately advanced, do better." It seems to be generally conceded that of patients treated with tuberculin a far higher percentage lose the

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tubercle bacilli from their sputum during the period of treatment than those being treated without it. It has been said that tuberculin is a two-edged sword, if given rightly it may do some good and not do any harm but if given injudiciously it may produce irreparable results.

The idea is to give the injections by commencing with very low dilutions which should be increased gradually over a long period of time. If the weight as well as other signs and symptoms of the patient are carefully watched and correctly interpreted by the physician no injurious effects can be produced. Tuberculin does not necessarily cause an increase of cough and expectoration. Frequently no such reaction occurs, but if it does it usually lasts for several days and then gradually subsides. The most suitable patients are those not showing symptoms of exhaustion from the fight with the disease or those who are in good general condition with few or no constitutional symptoms such as fever, cough, loss in weight, etc. The cases with localized forms of tuberculosis such as of glands, bones, skin, eyes, etc., are usually favorable ones for tuberculin treatment.

It must be remembered: that tuberculin is only an adjunct in the treatment of the disease and not a cure-all; that at best it must not be relied upon to do more than assist toward recovery; that it may fail to do even that except for certain cases

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well adapted for such treatment; that it will do no harm if properly administered; but above all, it must be remembered that the real treatment from which the most marked beneficial results may be expected is rest, fresh air, and diet.

TUBERCULIN AS A DIAGNOSTIC AGENT

The most valuable use of tuberculin has been as a means of diagnosing tuberculosis. Various tests have been devised by which tuberculin is used for this purpose.

Nearly all children react to the skin test for tuberculosis. The various skin tests and the eye test are based upon the fact that when tuberculin is placed on a scarified skin surface so as to come into contact with the blood or on the thin membrane containing many blood vessels covering the eye, there will be a reaction manifested by redness and swelling in tuberculous individuals as well as in people infected but showing no symptoms of the disease.

The skin test is of far more value when it is negative, producing no reaction, than when it is positive, resulting in a reaction. When it is negative in a person apparently well it proves that there has been no recent infection or activity. But when there is a positive reaction it admits of varied interpretations. For instance, the person tested may

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have had an infection at some previous time possibly in early youth and he may still show a sensitiveness to the poison by reacting although his lesion be entirely healed; also it may be the evidence of present activity of the disease somewhere in his body.

The subcutaneous test consists in injecting tuberculin beneath the skin and observing the results or reaction. This particular test may be harmful if not given judiciously because there is much absorption of the tuberculin into the system. It should only be used in those infections and latent cases where the physical signs are not marked. The injection of tuberculin in sufficient strength for diagnostic purposes may be attended with danger even when diagnostic skill is available. The development of the use of the x-ray for the diagnosis of lung conditions has made the use of the subcutaneous test unnecessary in a number of cases. All other data should be obtained before this test is resorted to and then it should only be given by a physician thoroughly familiar with the action and use of tuberculin.

CHAPTER XV

DRUGS

There is no drug, secret, synthetic or otherwise, that has been used successfully to cure tuberculosis. Certain drugs are necessary occasionally to combat symptoms but they should always be prescribed by an able physician. Many times the patient will hear remarkable tales of some concoction such as pine tar water, sage tea, mullen leaf tea, or other magic potions or inhalers having effected the cure of someone but before experimenting with any such treatments that are more than likely to have ill effects upon his system he will do well to remember that these things have absolutely no value in the treatment of tuberculosis, that it is a disease of variable ways and that many cases improve under all kinds of conditions.

The patient who has been accustomed to treat himself for ills that he did not consider serious enough for which to call a physician should discontinue that practice after he has been pronounced tuberculous. That custom at all times dangerous becomes doubly so then for many drugs are contraindicated in this disease. For instance, quinine which is often used by the layman when he

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feels a cold coming on, if taken in large doses is particularly harmful to one having tuberculosis; hence the wisdom of always consulting the physician.

The oils such as olive oil, cod liver oil, or some modified preparation of them are frequently beneficial to the tuberculous because they contain high amounts of assimilable fat. Judgment must be exercised, however, in their use, for oils have a tendency to inhibit or prevent the gastric juices from acting properly by overtaxing them. A teaspoonful to a dessertspoonful three times a day is not too much and some patients can comfortably take much more.

The use of tobacco and snuff can not have any but hurtful effects upon the patient. Usually men who use Copenhagen snuff are very slow to show any progress even when the infection is incipient. If an inveterate smoker finds that his habit can not be broken at once without uncomfortable nervous effects he should try doing so by gradually decreasing the amount of smoking. Under no conditions should he inhale any smoke.

Patients that have been heavy drinkers seldom show much resistance to the disease. Whiskey and beer drinking even in small quantities only tend to aggravate existing symptoms rather than improve them. Alcohol in all forms and at all times is injurious for those patients having too much

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acid in their stomachs but for those who need an appetizer or a stimulant for the digestive juices a wine glass of malt liquor before meals will sometimes give advantageous results.

Hypophosphites have been claimed by some to be beneficial and at best they have not yet been proved harmful. Creosote used to be taken systematically by tuberculous patients but it should be used only when prescribed by the physician as it has a tendency to irritate the stomach.

Frequent attempts have been made to kill off the germs and promote healing by injecting various chemical reagents into the blood or into the bronchial tubes but the results have been discouraging. Hardly a year goes by without the discovery of some chemical which is supposed to have a beneficial effect upon tuberculosis patients. Nothing has been found so far that has a selective affinity for the tubercle bacillus and will destroy it in the body without doing harm to the body tissues. This specific drug is sought earnestly by many good laboratory workers devoted to the study and cure of tuberculosis.

CHAPTER XVI

INDUCED OR ARTIFICIAL PNEUMOTHORAX

This operation for the treatment of certain selected cases of pulmonary tuberculosis has again come to such prominent notice during the past five years that a short history and explanation of its nature may be of interest.

Toward the end of the nineteenth century when observers were beginning to recognize the importance of rest, their attention was also attracted to the fact that frequently decidedly beneficial effects resulted from fluid in the chest or pleural effusion in tuberculous patients. Over a century ago the great French physician Laennec, who invented the stethoscope that was afterward used to diagnose him as a consumptive, had taught physicians the principles of chest diagnosis as they are known today and through his teaching it was made easier to detect fluid in the chest. It was noticed that on the appearance of fluid sometimes the fever would subside, the severity of the cough moderate, the amount of sputum decrease, and the general condition improve; but that when the fluid was drawn off these symptoms would reappear. After L. Spengler had several such striking cases

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as this he suggested injecting a strong chemical irritant, silver nitrate, into the chest to produce fluid. The valuable conclusion which was the outcome of these observations and upon which all agreed was that the beneficial results were due to the immobilization or putting to rest of the lungs.

In 1821 Carson noticed that sometimes in advanced cases after a rupture of the lung with collapse ensuing had occurred, the patient occasionally improved, and he suggested producing such collapse artificially by injecting air into the pleural or chest cavity. In the same year, 1882, that Koch discovered the tubercle bacillus, the Italian Forlanini reported cases of wonderful improvement after collapsing the lung by injecting air into the chest cavity. This operation was called induced or artificial pneumothorax* and he advised using it as a means of treatment. Ten years later he began to use this method being the first one to do so, and three years afterward he reported a cure resulting from prolonged injections of nitrogen gas into the chest cavity thereby collapsing the lung. Nitrogen gas was used because it was not poisonous or irritative and not readily absorbed. In 1898 Dr. Murphy, an American, not having read of this work, experimented in a manner almost identical with Forlanini's, and later

*The word pneumothorax is derived from two Greek words meaning air and chest.

Artificial Pneumothorax

with the assistance of Lemcke placed this system of treatment on a practical basis. When Lemcke died the subject was almost abandoned until 1912 when Robinson and Floyd, Lapham, Rothschild, etc., revived it.

Then it was that it was first used at Saranac Lake and other tuberculosis centers in this country. It was about that time that Dr. Edward L. Trudeau, the pioneer advocate for the rest treatment in this country, became so ill with alarming symptoms of the tuberculosis with which he had been affected for many years that as a last resort the pneumothorax operation was performed on him in the hope of prolonging his life which hope was not vain for he recovered his strength in part and lived until the close of 1915.

There are many different kinds of apparatus on the market for performing the operation but the principle of all is the same: to inject air or nitrogen gas into the chest cavity in greater or less amounts with the purpose of immobilizing the lung. Of the many conditions controlling its use, the most important is that one lung should be fairly healthy so that the danger of overburdening it and possibly starting an active tuberculosis there will be minimized. Also in cases where there has been chronic pleurisy and strong adhesive bands exist between the lung and the chest wall over the diseased lung it is sometimes impossible to collapse the lung.

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The operation seldom proves at all painful. In the beginning the injections are made as frequently as every four or six days; but later it does not become necessary to replace the gas except at the longer intervals of from four to six weeks. The pneumothorax may be maintained for a year or more after which the injections are withdrawn and the lung slowly allowed to expand.

It has been shown that the lung by being put to rest in this way has healed entirely; that scar tissue grew much faster during the period; that cavities, if small, have become obliterated; and that hemorrhages have been successfully stopped by it when other methods failed. There is still much to be known about the operation and the indications for it so that only the wisest counsel should be accepted before commencing the treatment.

CHAPTER XVII

SURGERY OF PULMONARY TUBERCULOSIS

Surgeons have long entertained the hope that early pulmonary tuberculosis could be cured by removing the diseased area. Aside from the compression of the lung by means of nitrogen gas described under artificial pneumothorax surgical operations on the tuberculous chest have been disappointing.

So early as the seventeenth century hazardous experiments were made without proving of any value in treatment and which are only of historical interest. Baglivi attempted to tap and inject tuberculous cavities. In 1670 Bligney reported the historical case of cure of cavity resulting from an accidental sword thrust in a duel. Mosler injected into a cavity a solution of permanganate of potash and so late as 1874 Dr. Pepper tried to revive this method. Corrosive sublimate was injected about a lung focus by Hillier.

In more recent years attempts have been made to place surgery of the lungs on a more scientific basis and encouraging results have been obtained in conditions other than tuberculous. However, no patient in the incipient stage when suffering no

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pain and experiencing very little discomfort is going to submit to such a radical procedure and the advanced case is so lowered in vitality that it is practically hopeless to undertake any such operation upon him. A cavity case is seldom suitable for operation. The injecting of substances into cavities or the tapping of them has failed utterly and opening and draining one is practically useless for it is thought best to allow cavities to drain into the bronchial tubes. Cases where the tuberculous area or focus has been cut out have been reported but it is the general opinion of all medical men that this should not be done because it is very difficult properly to locate the focus even with the x-ray. When nature attempts to heal the tuberculous lung by growing fibrous-like tissue about the softened or diseased areas the fibroid areas contract or draw together in time similar to the contraction seen in any scar that is the result of a wound or burn in the skin. If there is much replacement of lung substance by this scar tissue there is a contraction of a whole or portion of the lung. The rigid nature of the chest wall prevents this to any great extent, especially if there are adhesions between the lungs and the chest wall.

In 1871 Dr. Allis advocated cutting the ribs and allowing the chest wall to sink in especially if the disease was one-sided. Other modifications of this method have been tried but all have proved un-

Surgery of Pulmonary Tuberculosis

certain and dangerous. Certain noted surgeons occasionally report a successful case of operation but the procedure has not been placed on a sound scientific basis nor has it been recognized by the medical profession as a proper one. The mortality in all these cases is considerably higher than it is for incipient tuberculosis treated by the modern rest method and all other accepted methods of treating early tuberculosis of the lungs should be tried before any surgical interference is allowed.

CHAPTER XVIII

VALUE OF SANATORIUM TREATMENT

Just as rest in the open air is the chief factor in effecting the cure of tuberculosis, the sanatorium is the best possible means of bringing this about.

The physician makes the diagnosis, determines the stage and duration of the disease, considers the age of the patient, his financial and social condition and tries to advise according to the individual requirements of the case. Even if the patient's financial condition permits him to be treated at home, the physician will in all probability advise him to go to the sanatorium for nowhere will the regime of rest and exercise be carried out in a more systematic manner than at a sanatorium. At such an institution the patient is under the daily surveillance of a physician specially trained to treat his disease and is being looked after by nurses whose duty it is to note all aspects of his condition. This constant care lessens the chances for the development of unheeded complications and ensures the regular treatment indicated for the disease.

The sanatorium is a "college" where the patient learns how to take care of himself for the rest of his life. Whether he remains only until he is ben-

Value of Sanatorium Treatment

efited or through the entire course of treatment until his disease becomes "arrested" so that he may "graduate" with "honors," he has learned something of great value in knowing how to care for himself. Sanatorium life is an education in itself. The physician may talk for hours trying to guide and point out the various little things which are so essential to bring about a restoration of health and yet it may not and frequently does not make the impression upon the patient that a few weeks in a well conducted sanatorium would make.

There the patient will meet other patients fighting every stage of the disease and he will hear their experiences and be able to profit by them. He will see some making rapid improvement who, it may be, were much worse upon their entrance than he was. He will learn to know others who are making much slower progress and so the seriousness of the disease and the dangers of relapse will be shown him. He will make the acquaintance of some of those foolhardy patients who can not accept their physician's advice and who daily commit indiscretions and carelessly disregard the sanatorium regime and he will observe their relapses and downfalls as their disease slowly progresses. He will say good-bye to many who are going home "the picture of health" after their treatment there and he will feel encouraged by their splendid response to the "cure" to continue being faithful

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and cheerful himself. There are constant changes, new friends, new faces that interest him and the time slips by faster than he can realize.

At the sanatorium there is an atmosphere of "taking the cure" and the patient is not looked upon as an invalid surrounded by well and vigorous people who little understand or show small sympathy with his case. Everybody is there with one view and for the same purpose. He is not made to feel uncomfortable for fear people may be timid about approaching him because of his infection and he learns how to take precautions so that he will not infect others. Also, and by no means least in importance, the patient who has had this training, who by force of circumstances has passed through this new school of experience will become a teacher of others able to help and advise them. Many cases of tuberculosis are sent to the physician and even to the sanatorium direct by an ex-patient who has learned to read the early signs and symptoms of the disease.

Dr. Herbert King says, "Every patient, from whatever walk in life, presenting a reasonable prospect of material improvement or 'arrest' of the disease should, if possible, be given the advantage of at least a preliminary course of treatment and instruction in a sanatorium."

The incipient and moderately advanced cases

Value of Sanatorium Treatment

with no or slight complications are the most suitable ones for sanatorium treatment.

The chronic case may also improve greatly under the regular regime of rest, fresh air, and diet of the sanatorium. Because he is able to keep going in a sort of way frequently he neglects "cure taking" altogether until it is too late. So many questions have been asked about such a case that an explanation may be appreciated. A chronic case is one in which there is a tendency to relapse because the resistance is not quite sufficient to overcome the disease completely, so that slow progressive changes are going on in the lungs all the time, periods of breaking down being followed by partial healing. The very chronicity of such cases, however, shows that they possess a latent resistance that will bring about complete healing as has frequently occurred if it can be stimulated into action. A chronic case does not necessarily mean that one can not return to good health but that he is less likely to do so than one who responds more readily to treatment. He may perform a certain amount of daily work that is consistent with his strength and live a full span of life. Such a case was the immortal Trudeau's whose marvelous work for patients in their fight against the disease was all accomplished after his attention was centered upon tuberculosis as the natural outcome growing from

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the diagnosis, treatment and progress of his own condition.

There is no advantage for a far advanced case with progressive disease to enter a sanatorium unless home conditions would indicate it as much for the rest of the family as for the patient.

In this country the past few years have seen such strides in the campaign against tuberculosis chiefly by the establishment of sanatoria that the treatment is being extended to a steadily increasing number of cases, particularly those dependent upon the state for support. Not only the states but the various counties in them and the larger municipalities are providing sanatoria for the care and treatment of their tuberculous patients so that few who are really in earnest about trying to get well are refused an opportunity to do so.*

*A list of sanatoria for the treatment of tuberculosis in the United States may be purchased from "The Journal of the Outdoor Life," 381 Fourth Avenue, New York City. This list contains rates, location, conditions of admission, etc.

CHAPTER XIX

CONTROLLING THE COUGH

It is remarkable to what extent coughing may be suppressed if the utmost will power is exerted. When the patient realizes what exceedingly harmful effects result from his cough, he will certainly endeavor to control it whenever possible even if this has to be accomplished by medicine although nothing except what has been prescribed by the physician should be taken.

The immediate injurious results of violent coughing are many and serious. It gives rise to fatigue and exhaustion of all the organs of the body, a condition which is especially to be avoided by the tuberculosis patient. It may occasion a reflex irritation of the stomach that will produce vomiting and consequent loss of appetite. It always makes the pulse rate much faster than normal and the increased pulse beat sometimes continues for several hours after the coughing spell is over, thus over-taxing the heart which already has its full quota of work to perform. It may tear down the delicate strands of scar tissue that are weaving themselves about the infected parts and so discourage their future growth by allowing the germs to re-

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commence their work. It may scatter the infecting bacilli through a portion of the lungs that is functioning healthily, originating other foci of activity. It may be the means of causing hemorrhage as the outcome of a ruptured blood vessel whose walls were previously weakened by the disease. And it will prevent the diseased lungs from healing so long as it persists in any degree of severity.

When coughing, the tuberculous patient should always cover his mouth with a handkerchief. To use the bare hand is an unclean practice, for it may become contaminated with the tubercle bacilli which will be transferred to everything touched by that hand and so prove the means of infection to others.

It is a great outrage upon the various organs of the body to expect them to take care of sputum that is swallowed which may furnish the infecting medium to them, thus very seriously complicating the fight for recovery.

SPUTUM

An arrested case of tuberculosis may continue to expectorate after healing takes place but the sputum should not contain the bacilli. An apparently cured case may keep on expectorating to some extent if there is some other associated condition as catarrh. The bacilli are absent in an apparently cured case.

Controlling the Cough

When sputum floats on water it is because air is mixed with it. The thicker forms are heavier, contain less air and consequently sink. The various colors of the sputum as greenish, yellow, cream, dirty gray, etc., depend upon different factors. The greenish sputum is due to pus which is produced by the inflammation and disintegration in the lungs or bronchial tubes. The usual color is yellow but some putrefaction germs cause it to turn green or other color. Color may be added from the mouth or throat after eating or drinking certain substances such as chocolate, etc. Nothing in the appearance of the sputum indicates that there are tuberculosis germs in it.

Great care should be exercised in the disposal of the sputum. No one, whether tuberculous or not, should ever expectorate on the street or in any place where it must lie exposed; for sputum always indicates a diseased condition and contains bacteria of some kind.

Folded gauze or paper napkins which should be burned immediately may be used in which to expectorate but it is wise for the patient with any considerable amount of sputum to carry a cup with him for that purpose.

There are many sputum cup holders with waterproof fillers or containers on the market. These containers may be burned and the frames or holders boiled or placed in an antiseptic solution.

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Pocket sputum flasks are also obtainable which may be cleaned easily.

All sputum should be burned if possible, otherwise it should be boiled or soaked in a strong antiseptic solution before being emptied into the sewer.

For bed patients a new five or ten pound paper sack should be pinned to the bed near the pillow in which to place "used" or soiled napkins, gauze, etc., which may be burned at the end of each day.

CHAPTER XX

KEEPING THE MIND HEALTHY

Dr. E. L. Trudeau's favorite advice to patients newly pronounced tuberculous was, "Open the windows, go to bed, and don't worry." This last exhortation is most difficult to heed and yet so important that the ablest specialists have been known to say that recovery was impossible while it continued. Observers and the physicians of many patients suffering from tuberculosis always make a more encouraging prognosis for those who are optimistic, pleasant, cheerful, and obedient to instructions. One even goes so far as to assert that a pessimist can not recover from the disease.

Undoubtedly the hardest task for the patient when he is really ambitious to control his mind properly is to learn to forget himself and his physical condition except at such times as it would be negligent to do so. If he teaches himself to exert his will power to the extent of having keen enjoyment in reading, quiet conversation, and other interests outside of himself, the tendency to extreme depression, nervousness, and excitement so noticeable during the early weeks of "cure" taking will gradually diminish and he will soon realize that his

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acquired calmness and serenity are assisting other treatments most materially toward his recovery.

Some of the commonest practices that are known to excite and worry patients are letter writing, constant use of the thermometer, and the reading of books on the subject of his illness, particularly those written for the medical profession and from which he may get entirely wrong impressions of the disease. A certain amount of letter writing is necessary but the patient should not feel obliged to keep up a rapid fire correspondence that uses much of his energy and time and is certainly not a restful occupation with a large circle of friends just because many of them, through a total misapprehension of the rest cure, expect him to do so. The habit of taking the temperature and pulse several times oftener each day than is necessary frequently keeps a patient in a fever of excitement much of which would probably disappear if he threw away his thermometer and forgot his heart was beating while he rested his body and mind. Some patients' anxiety about their physical condition reaches the point where they become extremely ill from excitement when they anticipate an examination.

Great anger or deep sorrow will produce alarming symptoms in a perfectly healthy person and dangerous ones in one suffering from tuberculosis.

The chances for the recovery of the pleasant natured, even tempered, unselfish, optimistic patient

Keeping the Mind Healthy

who fights bravely against any odds are as great as a hundred to one when compared with those of the one possessing a complaining, sour, self-centered pessimistic disposition who makes no effort to forget his own distempers and spreads gloominess all about him. One should bow to his misfortunes making the best of them philosophically hoping they will prove blessings. When describing the growth of character often resulting from what seemed at the time crushing calamities, Emerson wrote:

“It permits or constrains the formation of new acquaintances and the reception of new influences that prove of the first importance to the next years; the man or woman who would have remained a sunny garden flower, with no room for its roots and too much sunshine for its head, by the falling of the walls and the neglect of the gardner is made the banian of the forest, yielding shade and fruit to wide neighborhoods of men.”

CHAPTER XXI

PROPER LUNG VENTILATION

By this term is meant the proper method of ventilating or breathing which will carry the oxygen laden air to all the tiny air sacs of the entire lungs without injury to them especially when tuberculous.

The usual method advised some time ago was to prescribe deep breathing exercises even after the lungs were found to be affected. Even today certain physicians advocate a suction mask to be worn in early cases of tuberculosis which allows the exhalations or air to be breathed out freely but slightly retards the inhalations or air passing into the lungs on the principle that this will promote healing faster by causing the blood and lymph to flow to those parts as well as developing the chest muscles. The principle is directly opposed to immobilizing or putting to rest the lung by compressing it with gas as is done in the artificial pneumothorax* (air in the chest) operation.

It seems inconsistent, however, to advise deep breathing or increasing the respirations of a lung with softened areas which delicate strands of scar tissue are endeavoring to surround and interweave

*See, Induced or Artificial Pneumothorax.

Proper Lung Ventilation

during the process of healing. The increased expansion would tend to break down these fine strands or rupture a blood vessel whose walls have been weakened or made brittle by the bacilli and thereby extend the disease. The process may be compared to results obtained by walking on a broken leg before the bony parts have had time to unite.

When a case is tending toward recovery, active symptoms of the disease have subsided, and the patient has been on exercise with continued improvement there is little or no danger in slowing the respirations voluntarily. To do this one should not breathe deeper than ordinarily but commence to practice, at short intervals in the beginning, attempting to hold the breath just a trifle longer than usual without increasing the depth of the respirations. This process allows the air to pass everywhere to all parts of the lungs and increases the absorption of the oxygen by the blood. For example, if a person is breathing from eighteen to twenty respirations per minute and endeavors during short intervals at different times of the day to breathe fifteen or fewer without discomfort, he will ventilate the lungs with far less danger than by taking deep breathing exercises. A patient who has shown any tendency to hemorrhage should not attempt this unless his case has been pronounced

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arrested by his physician. That prolonged deep breathing is injurious even for a normal person is proved by the dizziness and other uncomfortable symptoms resulting from its practice.

CHAPTER XXII

PRECAUTIONS TO BE OBSERVED BY THE PATIENT WITH ACTIVE TUBERCULOSIS

There are certain necessary precautions to be observed by the tuberculous patient with an open lesion in order that he may protect his lungs from further injury and, at the same time, guard against exposing his associates to infection.

CARE OF THE TEETH AND MOUTH

In any person with an active tuberculosis there is a tendency for the teeth and gums to become diseased no matter how careful he may be. Spongy bleeding gums having pus pockets and an unhealthy color are not uncommon symptoms accompanying the disease. To avoid this so far as possible the teeth should be kept scrupulously clean and a dentist should be consulted more frequently than when the patient's body was in perfect condition. The daily massage of the gums with a strong solution of salt water after using the brush with paste or powder will assist greatly in keeping the mouth healthy.

All patients should have a supply of a good al-

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kaline mouth wash to be used for cleansing the mouth before every meal.

THE USE OF THE ARMS

Great care should be exercised in the use of the arms. The patient should never lean his full weight upon his arms nor should he lift even light weights. Such a strain upon the chest muscles may cause the diseased lung tissue to tear apart to such an extent that the tubercle bacilli will be scattered through portions of healthy lung to begin their work in new centers.

A woman with very heavy hair should not shampoo it herself while there is activity in her lungs. If combing and dressing it fatigues her she should not try to care for it herself.

MENSTRUAL DISORDERS

Menstrual disorders are not uncommon in women affected with pulmonary tuberculosis. Frequently there is a suppression of menstruation as well as prolonged intervals between periods, more rarely there is an excessive menstruation. These conditions tend to regulate themselves coincident with general improvement and a return of strength.

MUSTACHES AND BEARDS

Men patients wearing mustaches and beards should have them removed because they harbor the

Precautions To Be Observed

bacilli in great numbers which increases the chance of reinfecting themselves besides the danger to others.

CAVITY

Having a cavity in the lungs is no indication that the patient's condition is hopeless or that his lungs can not heal. Many times a cavity is thoroughly walled off by thick fibrous tissue and sometimes patients go through life with a small cavity that is never discovered. It is wise for the patient who knows he has a cavity to observe extra precautions against relapse even after his case has been pronounced arrested.

SPECIAL TREATMENTS

Osteopathic treatments which attempt to accomplish the readjustment of any parts of the body that may be thought to be out of place by using the bones as levers, as well as chiropractic treatments whose advocates claim to heal disease by manipulating the spinal column are not to be recommended for trial by anyone having tuberculosis.

Recently the x-ray has been used in the treatment of tuberculous patients but the proper exposure is so little understood that it should not be considered until it is placed on a more scientific basis.

No operation such as the removal of tonsils,

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adenoids, a goiter, the appendix or one involving the pelvic organs should be allowed by the tuberculous patient unless both the tuberculosis specialist who has charge of his case and the surgeon who has been acquainted fully with the details of his condition agree that it is absolutely necessary.

CHAPTER XXIII

PRECAUTIONS TO BE OBSERVED BY THE HEALED CASE

It is generally conceded that no matter how slight the open lesion in pulmonary tuberculosis, how incipient the case, it can not be healed in less time than six months of the most careful "cure." When all constitutional symptoms such as elevation of temperature, fast pulse, loss of weight, fatigue, night sweats, poor appetite and digestion, severe coughing, and expectoration with bacilli have disappeared, frequently the patient is then in the most danger of relapse resulting from some indiscretion unwisely indulged in because he feels so well. A person who has recovered sufficiently to be considered an arrested case or even one apparently cured should observe many precautions about physical exercise that a normal person could reasonably ignore.

When a relapse occurs in a healed case or the disease appears in some other part of the body besides the lungs it is thought that the disease has extended from the old process rather than been produced by reinfection from other sources. There is no proof that a person once healed may not get an

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infection from outside sources but this is very unlikely unless he has been an arrested case for some years and has been in constant contact for a considerable length of time with the tubercle bacilli due to some carelessness. If there is a setback after the patient has been pronounced healed, the stage of the disease is always more advanced and the chances for recovery fewer. The discipline and training received by the patient before his case was pronounced arrested should never be entirely disregarded and he should continue to live hygienically by observing regular hours, not allowing himself to become fatigued, and spending as much time as possible in the open air.

Learning to use the arms wisely and carefully is one of the most important precautions to take. By thought and a little practice the forearm can be trained to do such work as lifting without overtaxing the muscles of the chest and upper arm. Heavy lifting, pulling or hanging by the arms should always be tabooed. Hard boat rowing is injurious but a little canoeing at times may not prove so. Swimming, tennis, and golf should never be indulged in because they call into play muscles that should have no strain upon them besides the additional work for the heart and lungs occasioned by running and the excitement of the games.

Other pleasures that the healed case will be wise to forego are dancing, mountain climbing, and

Precautions for the Healed Case

horseback riding. He should always try to avoid living in small poorly ventilated rooms or spending much time in crowds. When walking in dark rooms, etc., he should be careful not to bump into anything as a hard blow will undoubtedly work mischief with his chest.

Among the many healthful pastimes he may enjoy out of doors with no harm to his physical condition unless carried to excess are skating, fishing, hunting, automobiling, kodaking, the study of botany, birds, etc.

Always the arrested case will do well to continue in close association with his physician consulting him about every new step anticipated as well as upon his physical condition so that no recurring symptoms will escape early attention.

CHAPTER XXIV

TUBERCULOSIS STATISTICS

The reader would probably not be so much interested in a series of tables showing statistics as in a general statement concerning the occurrence and curability of tuberculosis. Statistics are very misleading unless properly interpreted and understood in all phases. They show that from one of every seven to one of every ten persons die of tuberculosis and that double the number who succumb represents the number of living open cases.

In some parts of the country the mortality is much lower than in others. This depends upon many factors. A district with a formerly high mortality which has reduced the number of deaths proportionately has probably done so through an effective campaign against the disease. In certain cities where tuberculosis workers are cooperating and waging a systematic fight the death rate as well as the number of new cases has decreased faster than in country districts where the air is purer but where no care and precautions are taken against infection.

The only reliable statistics available for learning the curability of the disease under hygienic treat-

Tuberculosis Statistics

ment of rest, fresh air, and good food with tuberculin in suitable cases are those of sanatoria. Their tables show that anywhere from seventy to eighty per cent of the incipient cases, that about forty per cent of the moderately advanced, and from ten to thirty per cent of the advanced cases, depending upon the extent of the lesion and the number of complications, are living and well five years after their discharge from these institutions. It is very probable that a second breakdown of an incipient case causes sufficient extension to place him in the moderately advanced or even the advanced stage. In other words, an incipient's chances for apparently curing the disease after relapse decrease from seventy-five to forty per cent or less.

An early case of tuberculosis once healed should take care of himself for the rest of his life as though there were this possibility of relapse should he attempt to do those things tabooed for all time so far as he is concerned. This does not mean that his life can not be as useful nor his earning capacity as great as formerly for it sometimes occurs that both are increased, but it does mean the observance of those rules that govern a clean healthy life together with the discontinuance of overwork, worry, dissipation and excesses as well as physical exercises that this little book has attempted to show are injurious to healing and naturally are so although to a less degree after "cure."

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HOUSING CONDITIONS

During the past year considerable attention has been given to housing conditions and poverty in their relation to tuberculosis. If we are to believe observers who have carefully studied and reported existing conditions, the disease is more prevalent among families living in three rooms or fewer and among low wage earners.

CHAPTER XXV

THE DOUBLE RED CROSS

Since 1902 when Dr. Sersiron of Paris, the Associate Secretary of L'Association Centrale Francais Contre la Tuberculose, proposed the double red cross as the emblem or symbol of the International Anti-Tuberculosis Association which convened in Berlin that year and which adopted his suggestion, the double red cross has become known throughout this country as the legitimate sign representing the tuberculosis movement.

By action of the National Association for the Study and Prevention of Tuberculosis, for some time it has been the accepted official emblem of that organization. Although its appearance is somewhat similar to the Lorraine Cross of France and to one used in the Greek Catholic Churches still there is enough difference to prevent their being confounded with it, nor is it likely to be mistaken for the American National Red Cross.

Its particular points of interest are its cross arms which are equal in length, its ends all six of which are pointed, its upper standard which is shorter than and its lower standard which is longer than the cross arms themselves, and its color which is red.

CHAPTER XXVI

TUBERCULOSIS AND WAR

It is natural that a disease so prevalent as tuberculosis should receive special attention during war times. It is estimated that between forty and fifty per cent of men of military age react to tuberculin, showing that they have received a tuberculous infection at some time in their lives and that their bodies harbor either a healed or an unhealed focus.

For the unquestionably diseased cases seeking active military service there is but one answer and that is not to attempt it. There are many persons commonly known as "suspects" and they are the ones that require the greatest skill on the part of the medical examiner to determine if they are fit for service.

Many of the sanatoria cases who have been pronounced "arrested" or whose lungs are healed desire to enlist for active service. During the present war the majority of these cases who have been allowed to go to the front, break down and become a heavy expense to their government. Of course there are exceptions and some authorities seem to differ regarding this class of cases.

Selective conscription will aid to solve this prob-

Tuberculosis and War

lem in our country. Then if the "suspect" and healed case are allowed to continue their home occupations it is more than probable that they are rendering their country better service than they could at the front.

CHAPTER XXVII

DISTINCTIVE MEANINGS EXPLAINED

SANATORIUM AND SANITARIUM

There has been much discussion concerning the difference between the meanings of the words sanitarium and sanatorium. The former, sanitarium, which is derived from the Latin word *sanitas* that means whole or sound, is the general term and may be used as a name for any institution whose aim is to help patients retain or acquire good health. In a narrower sense it may signify an institution for the preservation of the health of its patients by using methods to prevent them from becoming diseased.

Sanatorium has its derivation from the Latin word *sano*, heal. Its meaning becomes clear at once: a place, sometimes supposed to be situated where climatic conditions are ideal, where active measures are taken to cure patients already suffering from disease.

TUBERCULOUS AND TUBERCULAR

In 1906 at its annual congress The Association for the Study and Prevention of Tuberculosis adopted the following distinction between the meanings of the words tuberculous and tubercular

A Vaccine and An Antitoxin

as reported by a committee appointed for that purpose because up until that time these two words were being used indiscriminately when tuberculosis was being discussed.

"In the interests of clearness and uniformity of nomenclature the Association shall employ in its official publication the term *tuberculous* to refer to lesions or conditions caused by the tubercle bacillus and the term *tubercular* to describe conditions resembling tubercles but not caused by the tubercle bacillus."

Hence, tuberculous is the word usually used in reference to a diseased process caused by the tubercle bacillus; tubercular means nodular and may refer to any disease or condition characterized by nodule or lump formation, as tubercular leprosy, tubercular cancer, etc.

A VACCINE AND AN ANTITOXIN

A vaccine is the poison, virus, or toxin of the offending germs, which may consist of the germs themselves in suspension or in solution, which is injected with the idea of whipping the blood to renewed activity in creating a resistance against the infection. In other words, it is adding more poison without more infection in order to call forth the disease fighting elements of the blood. Tuber-culin is a vaccine.

Antitoxin is something more than a vaccine. It

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consists in making repeated injections into healthy animals, usually a horse, of the vaccine or toxin of germs in amounts not sufficient to kill the animal. Then when the animal's blood has been stimulated thereby into throwing off antagonistic substances called antibodies against the toxin, the animal's blood serum is collected. This serum is antitoxin and when injected into infected persons it neutralizes or renders harmless the poison. Diphtheria and lock-jaw antitoxins are made in this way. This has not proved of any value in tuberculosis.

CONTAGIOUS AND INFECTIOUS

Following is the distinction between the meanings of the words contagious and infectious as given by the New Standard Dictionary.

"Infection is frequently confused with contagion even by medical men. The best usage now limits contagion to diseases transmitted by contact with the diseased person, either directly by touch or indirectly by use of the same articles, by breath, effluvia, etc. Infection is applied to any disease transmissible by germs whether such transmission is effected by contact, by the agency of insects or other creatures, or by diffusion by air, water, or fluids.

"The word contagion is correctly applied only to particular diseases: the word infection is all em-

Contagious and Infectious

bracing, and may be applied to every disease that is transmittable by germs."

Diphtheria is a contagious, and tuberculosis an infectious disease.

CHAPTER XXVIII

TERMS

Employed in the Classification of Pulmonary Tuberculosis and Definitions as Accepted by the National Tuberculosis Association, with Additions by Dr. Robinson Bosworth, St. Paul, Minn.

ON ADMISSION

These definitions indicate the furthest extent of disease and the greatest severity of symptoms that a patient can present and still belong to the stage defined. All patients beyond the incipient stage fall under the moderately advanced stage unless the physical signs and symptoms exceed those of the moderately advanced stage, when they should be classified as far advanced.

Incipient.—Slight or no constitutional symptoms (including particularly gastric or intestinal disturbance or rapid loss of weight). Slight or no elevation of temperature or acceleration of pulse at any time during the twenty-four hours.

Expectoration usually small in amount or absent. Tubercl bacilli may be present or absent.

Slight infiltration limited to the apex of one or both lungs or a small part of one lobe.

Terms

No tuberculous complications.

Moderately Advanced.—No marked impairment of function, either local or constitutional.

Marked infiltration more extensive than under incipient, with little or no evidence of cavity formation.

No serious tuberculous complications.

FAR ADVANCED.—Marked impairment of function, local and constitutional.

Extensive localized infiltration or consolidation in one or more lobes.

Or disseminated areas of cavity formation.

Or serious tuberculous complications.

ACUTE MILIARY TUBERCULOSIS

Following is the National Association classification as rearranged by Rathbun, of Otisville, N. Y. This more comprehensive classification was adopted by the American Sanatorium Association on December 7, 1916.

These combinations are interpreted as follows:

LESIONS

Incipient. Slight infiltration limited to the apex of one or both lungs, or a small part of one lobe. No tuberculous complications.

Moderately Advanced. Marked infiltration, more extensive than under incipient, with

SYMPTOMS

A. (Slight or None). Slight or no constitutional symptoms, including particularly gastric or intestinal disturbance, or rapid loss of weight; slight or no elevation of temperature or acceleration of pulse at any time during the twenty-four hours. Expec-

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LESIONS—CONT'D

little or no evidence of cavity formation. No serious tuberculous complications.

Far Advanced. Extensive localized infiltration or consolidation in one or more lobes. Or disseminated areas of cavity formation. Or serious tuberculous complications.

SYMPTOMS—CONT'D

toration usually small in amount or absent. Tubercl bacilli may be present or absent.

B. (Moderate). No marked impairment of function, either local or constitutional.

C. (Severe). Marked impairment of function, local and constitutional.

ACUTE GENERALIZED MILIARY TUBERCULOSIS

This schema offers the following combinations:

Incipient A. Moderately Advanced A. Far Advanced A
Incipient B. Moderately Advanced B. Far Advanced B
Incipient C. Moderately Advanced C. Far Advanced C

Incipient A. An incipient lesion with symptoms of the present incipient stage. Incipient B. An incipient lesion with symptoms of the present moderately advanced stage. Incipient C. An incipient lesion with symptoms of the present Far Advanced stage. Moderately Advanced A. Moderately Advanced lesion with symptoms of the present Incipient stage. Moderately Advanced B. Moderately advanced lesion with symptoms of the present Moderately Advanced stage. Moderately Advanced C. Moderately advanced lesion with symptoms of the present Far Advanced stage. Far Advanced A. Far advanced lesion with incipient symptoms, etc. The rearrangement unquestionably greatly increases the flexibility of the classification without appreciably modifying the original text.

Terms

DEFINITION OF TERMS

TERMS USED IN DEFINITION OF "INCIPIENT."

1. *Slight Constitutional Disturbance.*—Slight loss of appetite, of strength and of weight; lassitude; possibly slight acceleration of pulse or possibly elevation of temperature. The impairment of health may be so slight that the patient does not look or feel sick in the ordinary sense of the word.
2. *Slight Elevation of Temperature.*—Maximum of temperature after rest for one hour, never over 99.5° to 100° F. by mouth or 100.5° per rectum.
3. *Slight Acceleration of Pulse.*—Maximum pulse rate not over 90 after rest for one hour, sitting or lying, except when due to causes other than tuberculosis.
4. *Absence of Tuberclle Bacilli.*—Each monthly examination (if the sputum be negative) to consist of a careful microscopic examination, with a mechanical stage, of two smears devoting at least three minutes to each smear, made from selected particles (at least six from different parts) of the sputum on each of three successive days. The morning sputum should always be obtained, or, better, the minute bits that some arrested patients raise at very infrequent intervals. It is not yet deemed wise to insist on digestion and centrifugization or on inoculation of guinea pigs.

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5. *Infiltration.*—Physical signs of slight prominence of the clavicle, lessened movement of chest, narrowing of apical resonance with lessened movement of base of lung, slight or no change in resonance, distant or loud and harsh breathing with or without some change in the rhythm (i.e., prolonged expiration), vocal resonance possibly slightly increased; or fine or moderately coarse rales present or absent. If sputum contains tubercle bacilli any one of these.

6. *Apex.*—That portion of the lung situated above the clavicle and the third dorsal vertebral spine.

7. *A Small Part of One Lung.*—An area of one or two intercostal spaces, or an area not exceeding 60 to 80 sq. cm. in extent, according to the size of the patient.

TERMS USED IN DEFINITION OF "MODERATELY ADVANCED."

8. *Marked Impairment of Function, Either Local or Constitutional.*—Local: Marked dyspnea on exertion limiting seriously the patient's activity. Constitutional: Marked weakness, anorexia, tachycardia.

9. *Moderate Extent of Localized Consolidation.*—An area of one-half lobe less, but may involve both apices; marked dullness or decidedly bronchovesicular breathing; markedly increased vocal

Terms

resonance; rales usually present. These signs are to be sharply limited as to area instead of gradually shading into normal physical signs.

10. *Evidence of Destruction of Tissue*.—Presence of tubercle bacilli or elastic fibers in the sputum or the presence of the physical signs of a cavity. There are no absolutely certain physical signs of a cavity but a combination of any four of the following signs is to be taken as indicative of a cavity: (1) cracked-pot note; (2) amphoric breathing; (3) intense whispering pectoriloquy; (4) a veiled puff or post tussic suction; (5) bubbling or resonant rales. "Physical signs of softening" do not admit of any definition apart from that of cavity formation, and the term should not be used.

11. *Disseminated Fibroid Deposits*.—More or less localized areas of fibrous tissue, producing on physical examination some change or dullness in the percussion note, more or less increase of vocal resonance, harsh, suppressed, or bronchovesicular breathing, rales usually sibilant or sonorous, but at times fine and moderately coarse.

12. *Serious Complications*.—These should be limited to tuberculous complications, such as meningitis, pharyngitis, laryngitis (except slight thickening of the posterior interarytenoid space, and superficial ulceration of a vocal chord), en-

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teritis, peritonitis, nephritis, cystitis, orchitis, adenitis (unless very slight), etc.

TERMS USED IN DEFINITION OF "FAR ADVANCED."

13. *Marked Consolidation* indicates dullness merging into flatness, bronchial or tubular breathing and other signs of consolidation as defined in Paragraph 10.

14. *Turban's Classification for Tabulation of Individual Cases.*

I. Extent of disease in the lungs.

I, II, III. Definitions following.

I. Slight lesion extending at most to the volume of one lobe or two half lobes.

II. Slight lesion extending farther than I, but at most to the volume of two lobes; or severe lesion extending at most to the volume of one lobe.

III. All lesions which in extent of the part affected exceed II.

By "slight lesion" we understand disseminated centers of disease which manifest themselves physically by slight dullness, by harsh, feeble, or bronchovesicular breathing, and by rales.

By "severe lesion" we mean cases of consolidation and excavation such as betray themselves by marked dullness, by tympanitic sounds, by very feeble bronchovesicular, bronchial, or amphoric breathing, by rales of various kinds.

Purely pleuritic dullness, unless marked, is to

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be let out of account; if it is serious, the pleurisy must be mentioned specially under head of "tuberculous complications." The volume of a single lobe is always regarded as equivalent to the volume of the two half lobes, etc.

15. Classification to be Used upon the Discharge of the Patient.

(a) *Apparently Cured* (formerly "Cured").—All constitutional symptoms and expectoration with bacilli absent for a period of two years under ordinary conditions of life.

(b) *Arrested*.—All constitutional symptoms and expectoration with bacilli absent for a period of six months; the physical signs to be those of a healed lesion.

(c) *Apparently Arrested* (formerly "Apparently Cured").—All constitutional symptoms and expectoration with bacilli absent for a period of three months; the physical signs to be those of a healed lesion.

(d) *Quiescent* (formerly "Arrested").—Absence of all constitutional symptoms; expectoration and bacilli may or may not be present; physical signs stationary or retrogressive; the foregoing condition to have existed for at least two months.

(e) *Improved*.—Constitutional symptoms lessened or entirely absent; physical signs improved or unchanged; cough and expectoration with ba-

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cilli usually present. (Cases which have had artificial pneumothorax should not be classified better than "improved.")

(f) *Unimproved*.—All essential symptoms and signs unabated or increased.

(g) *Died*.

TERMS USED IN DEFINITION OF "APPARENTLY CURED."

16. *Constitutional Symptoms*.—These include elevation of temperature, loss of weight, loss of strength, night sweats, chills, tachycardia, cyanosis, loss of appetite, amenorrhea, etc.

17. *Physical Signs of Healed Lesion*.—These may embrace every physical sign of infiltration or consolidation (see paragraph 5, 11) with the exception of rales, which must be permanently absent, except possibly a few fine rales at the base, probably atelectatic in origin, and at one apex or over a small part of one lobe. Rales in the latter two places are to be heard only during the cough, at the end of a prolonged expiration, or during the inspiration which follows the cough.

TERMS USED IN DEFINITION OF "IMPROVED."

18. *Constitutional Symptoms Lessened or Entirely Absent*.—By this is meant an improvement in the general condition as shown either by a gain

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in both weight and strength or by reduction of previous febrile temperature to normal without loss of strength.

TERMS USED IN DEFINITION OF "UNIMPROVED OR PROGRESSIVE."

19. *Essential Symptoms and Signs*.—These include among others, weight, strength, appetite, night sweats, hemoptysis, pleurisy, dyspnea, temperature, pulse rate, dullness, changes in vocal resonance and respiratory movement, rales.

TERMS USED IN DEFINITION OF "CURED."

20. *Ordinary Condition of Life*.—This term as used implies that the patient is able to live in an environment where he is able to support himself without the assistance of others, or to live in his former surroundings and pursue his former occupation.

TERMS USED IN DEFINITION OF "ONSET."

21. Catarrhal, Pleuritic, Insidious, Hemorrhagic, Febrile.

DEFINITION OF "GENERAL CONDITION ON ADMISSION AND ON DISCHARGE."

22. Favorable, Unfavorable.

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DEFINITION OF TERM, "TEMPERATURE ON ADMISSION."

23. Average maximum temperature for the first seven days.

DEFINITION OF TERM, "TEMPERATURE ON DISCHARGE."

24. Average maximum temperature for the last two days.

DEFINITION OF TERM, "DIGESTION ON ADMISSION AND ON DISCHARGE."

25. Impaired or unimpaired.

DEFINITION OF TERM, "STANDARD WEIGHT."

26. Normal weight of an individual according to the height, age and sex.

27. *Standard Weights.*

Age	BOYS	GIRLS
	Weight in Pounds	Weight in Pounds
5	41.09	39.66
6	45.17	43.28
7	49.07	47.46
8	53.92	52.04
9	59.23	57.07
10	65.30	62.35
11	70.18	68.84
12	76.92	78.31
13	84.85	88.46
14	94.91	98.23

For individuals over 15 years of age use following: Subtract $\frac{3}{4}$ pound for each year under 30

Terms

years of age. Add $\frac{3}{4}$ pound for each year over 30.
Subtract one inch for heels.

HEIGHT	MEN	WOMEN
	Pounds	Pounds
4 feet 10 inches	...	98
4 feet 11 inches	...	102
5 feet	112	105
5 feet 1 inch	116	110
5 feet 2 inches	126	114
5 feet 3 inches	133	121
5 feet 4 inches	139	128
5 feet 5 inches	142	135
5 feet 6 inches	145	139
5 feet 7 inches	148	148
5 feet 8 inches	155	158
5 feet 9 inches	162	...
5 feet 10 inches	169	...
5 feet 11 inches	174	...
6 feet	178	...
6 feet 1 inch	182	...

TERMS

28. "*Treatment at Sanatorium.*"

First: "Usual"—Ordinary sanatorium treatment.

Second: "Sun"—Exposure of body to direct rays of sun or "Heliotherapy."

Third: "Autoinoculation"—Graduated exercise to produce slight reaction.

Fourth: "Tuberculin"—Administration of tuberculin.

Fifth: "Operative"—For surgical cases.

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Sixth: "Immobilization"—Patient confined to bed during residence.

Seventh: "Forced Feeding"—Diet greatly increased over usual.

Eighth: "Artificial Pneumothorax."

Ninth: "Special."

NOTE.—Any combination of above may be employed.

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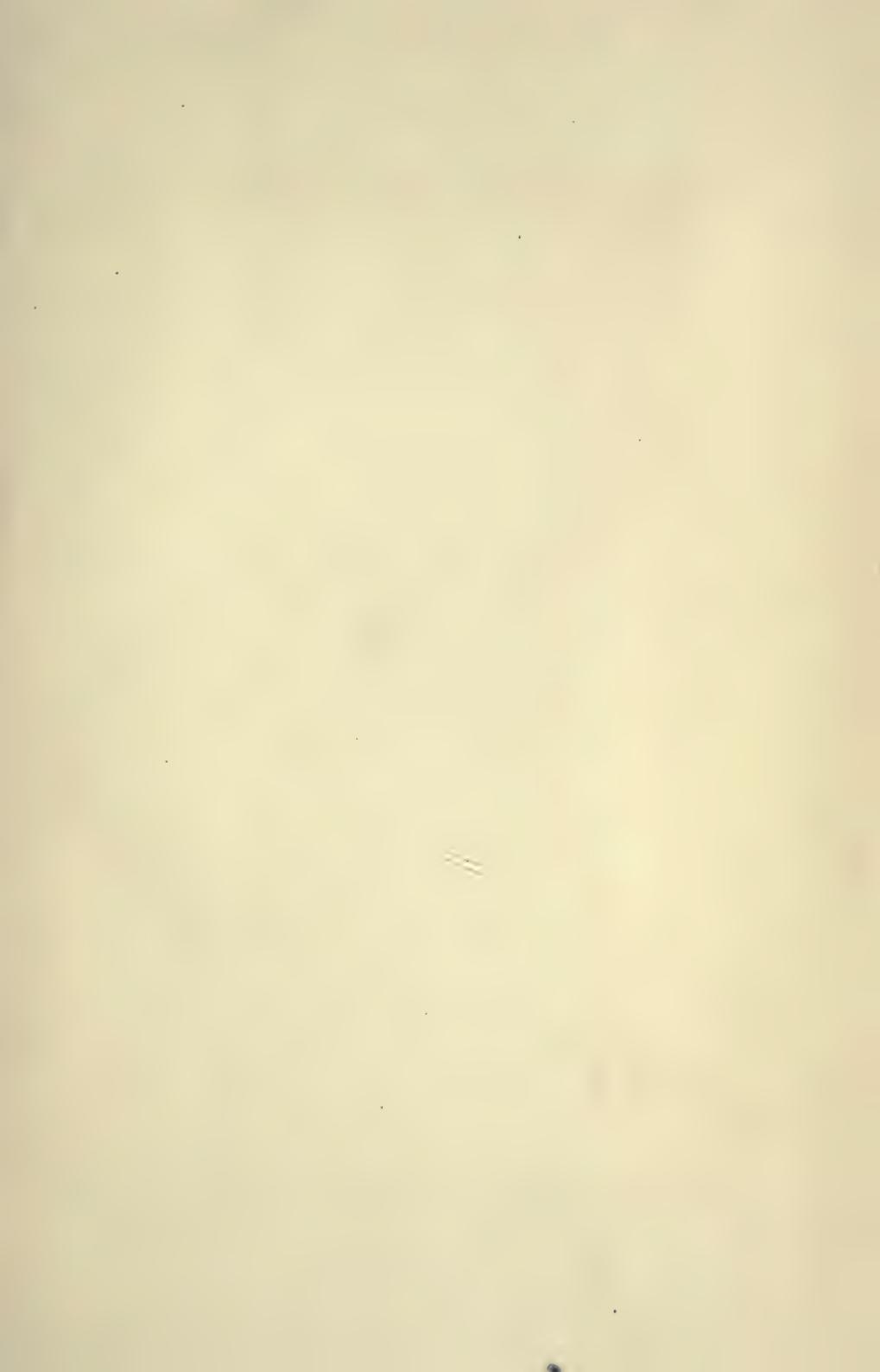
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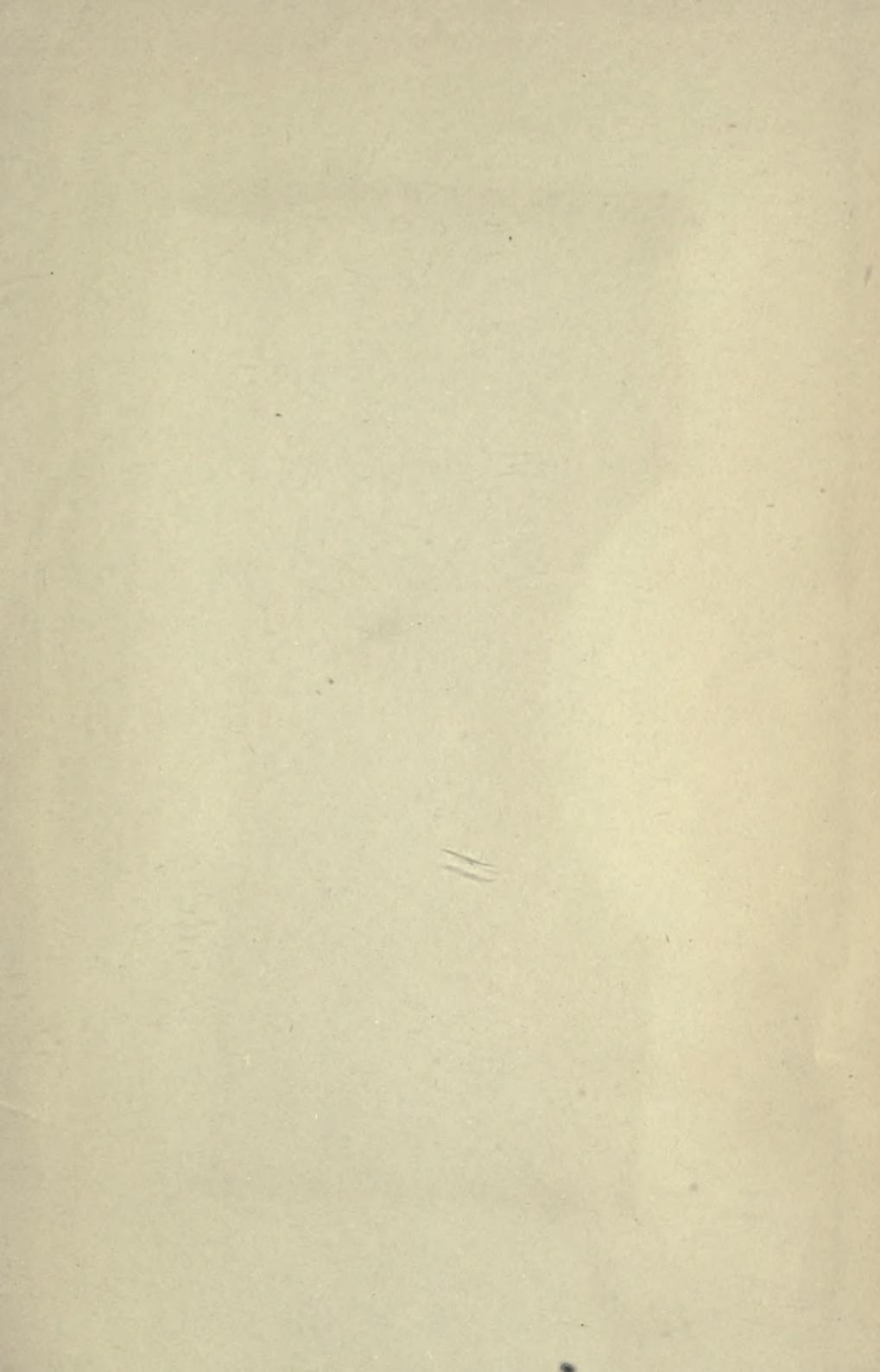
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